Flint Lake
Aquatic Vegetation Management Plan
2007-2011

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Prepared for:
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Executive Summary

Aquatic Control was contracted by the Valparaiso Lakes Area Conservancy District (VLACD) to complete aquatic vegetation sampling in order to create a lakewide, long-term integrated aquatic vegetation management plan. Flint Lake is located just north of Valparaiso in Porter County, Indiana. This plan was created in order to more effectively document and control nuisance aquatic vegetation within the lake. This plan was also created as a prerequisite to eligibility for LARE program funding to control nuisance exotic vegetation.

Aquatic vegetation is an important component of Indiana Lakes. Aquatic vegetation provides fish habitat, food for wildlife, prevents erosion, and can improve overall water quality. However, as a result of many factors, this vegetation can develop to a nuisance level. Nuisance aquatic vegetation, as used in this paper, describes plant growth that negatively impacts the present uses of the lake including fishing, boating, swimming, aesthetic, and lakefront property values. The primary nuisance species within the Flint Lake is the invasive exotic plant Eurasian watermilfoil (*Myriophyllum spicatum*). The negative impact of this species on native aquatic vegetation, fish populations, water quality, and other factors is well documented and will be discussed in further detail. The invasive exotic species curlyleaf pondweed (*Potamogeton crispus*) was also present at potentially nuisance levels.

The primary recommendation for plant control within the Flint Lake chain involves the use of Renovate herbicide to selectively control Eurasian watermilfoil throughout the lake. This type of treatment should preserve and enhance the population of native vegetation and relieve nuisance conditions created by Eurasian watermilfoil. Ideally, the goal of the treatment would be to eliminate this invasive species. However, this may be a difficult goal to achieve due to the abundance of this species in other lakes connected to Flint Lake and this plants ability to be easily transported from lake to lake. A more realistic goal should be to reduce Eurasian watermilfoil to a more manageable level where VLACD can easily afford future spot treatments on this species.

Currently, there is an abundant and diverse native plant population present in Flint Lake. This vegetation is very beneficial to the overall health of the Flint Lake ecosystem. Vegetation controls should focus only on the use of highly selective controls in order to reduce damage to the native population. Control of the invasive species should allow the native plant community to flourish. However, some small-scale control of native vegetation may be needed in high use areas in order to reduce potential nuisance conditions that may arise after Eurasian watermilfoil is controlled.

Acknowledgements

Funding for the vegetation sampling and preparation of an aquatic vegetation management plan was provided by the Valparaiso Lakes Area Conservancy District and the Indiana Department of Natural Resources Lake and River Enhancement Program. Aquatic Control, Inc. completed the fieldwork, data processing, and map generation. Special thanks are due to Bob Minarich and the Valparaiso Lakes Area Conservancy District for their help in initiating and completing this project. Special thanks are given to Bob Robertson and Jeremy Price, Fisheries Biologists for the Indiana Department of Natural Resources-Division of Fish And Wildlife, for their assistance and review of this plan. Special thanks are also given to Gwen White and Angela Studevant, Aquatic Biologist from the Lake and River Enhancement Program (LARE) for their review and assistance on this plan. Author of this report is Nathan Long of Aquatic Control. The author would like to acknowledge the valuable input from David Isaacs, Brian Isaacs, Brendan Hastie, Ronnie Gray, Joey Leach, Matt Johnson, Steve Lee, Kyle Richardson, and Barbie Huber of Aquatic Control for their field assistance, map generation, review, and editing of this report.

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1.0 INTRODUCTION

Aquatic Control was contracted by the Valparaiso Lakes Area Conservancy District (VLACD) to complete aquatic vegetation sampling in order to create a lakewide, long-term integrated aquatic vegetation management plan. The study area includes Flint Lake, which is located within a chain of lakes called the Valparaiso Lakes just north of Valparaiso in Porter County, Indiana. This plan was created in order to more accurately document the aquatic vegetation community and create a feasible plan for managing nuisance vegetation within Flint Lake. The plan is also a prerequisite to eligibility for the Lake and River Enhancement (LARE) program funding to control exotic or nuisance species. Two aquatic vegetation surveys were completed in 2006 in order to document the plant community. The surveys will provide valuable information that will allow for scientifically based recommendations for aquatic plant management. The focus of aquatic plant management will be on the control of exotic invasive species. However, some native vegetation in high-use areas may require some form of control.

The primary nuisance plant species in Flint Lake is the exotic species Eurasian watermilfoil. The invasive exotic species curlyleaf pondweed was also detected at potentially nuisance levels. The presence of the exotic emergent, purple loosestrife (*Lythrum salicaria*), was noted in previous surveys but not detected in 2006 sampling. It is important to initiate management of these species in order to reduce nuisance conditions and stop their spread. In order to successfully manage aquatic vegetation on a public body of water concerns of fishermen, lot owners, biologists, and the general public will have to be addressed. The purpose of this plan is to provide plant management recommendations that will balance the concerns of these interest groups while effectively relieving Flint Lake of nuisance aquatic plant growth while working towards the goals of the plant management program.

2.0 WATERSHED AND WATERBODY CHARACTERISTICS (Summarized from JFNew, 2003)

Flint Lake is the largest lake within a chain of natural lakes that includes, Canada, Deep, Long, Loomis, Mink, Moss, Silver, Spectacle, and Wauhob Lakes. The lakes are located just north of Valparaiso in Porter County, Indiana. In combination, these lakes have a surface area of 339.5 acres and a 2,560-acre watershed. Flint Lake is approximately 86 acres with a maximum depth of 72 feet, average depth of approximately 20 feet, and a shoreline length of 10,958 feet (Figure 1). Flint Lake's direct watershed encompasses 1321.1 acres. Residential areas occupy almost one half of the watershed. Most residential areas are high-density areas. Forested land and the chain of lakes themselves cover over a third of the watershed (JFNew, 2003).

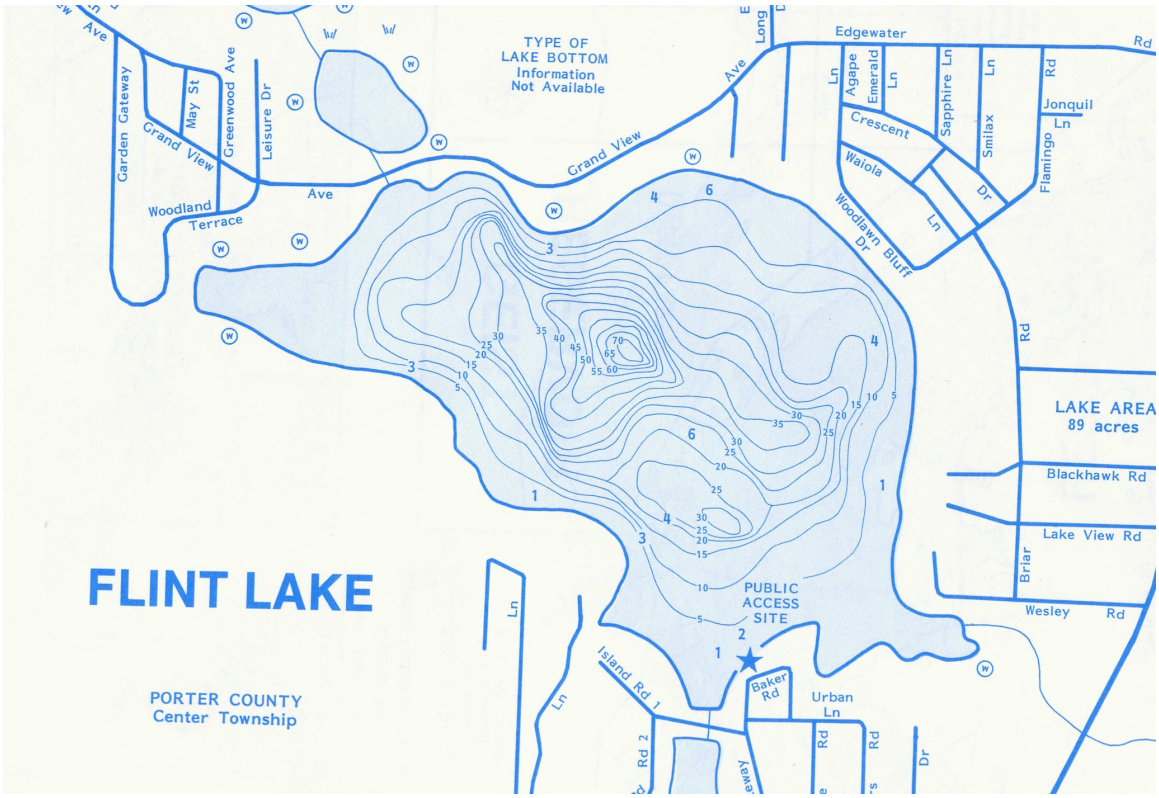

Figure 1. Flint Lake Bathymetric Map (Bright Spot Maps, 1999)

Flint Lake has extensive shallow areas with 45% of the lake area less than ten feet deep. The two coves in the northwest and southeast corners of the lake are the shallowest regions of the lake. Despite the extensive shallow areas, Flint Lake possesses a greater percentage of deeper water compared to other lakes in the chain. The relative abundance of deeper waters in Flint Lake increases recreational opportunities on the lake (JFNew, 2003).

Flint Lake's clarity appears to be poor when compared to other lakes in the chain. However, when comparing historical Secchi readings to ones taken the last three seasons, there appears to be an improvement. A much more detailed watershed and waterbody characteristics discussion can be found in the 2003 Valparaiso Lakes Diagnostic Study. This study was funded by the VLACD and LARE.

3.0 PRESENT WATER BODY USES

Flint Lake has been a resort site for Porter County residents for over a hundred years (VLACD website). Today, Flint Lake is used for a variety of activities. An access site is located along the southern shore. Virtually the entire shoreline of Flint Lake is developed residentially. The only undeveloped areas include two small bays in the southeast and northwest corners or the lake (Figure 2). Fishing, boating, and swimming are popular activities on Flint Lake. At a recent public meeting, lake users indicated that 50% used

the lake for boating and fishing, and 42% used the lake for swimming (survey included only 12 individuals).

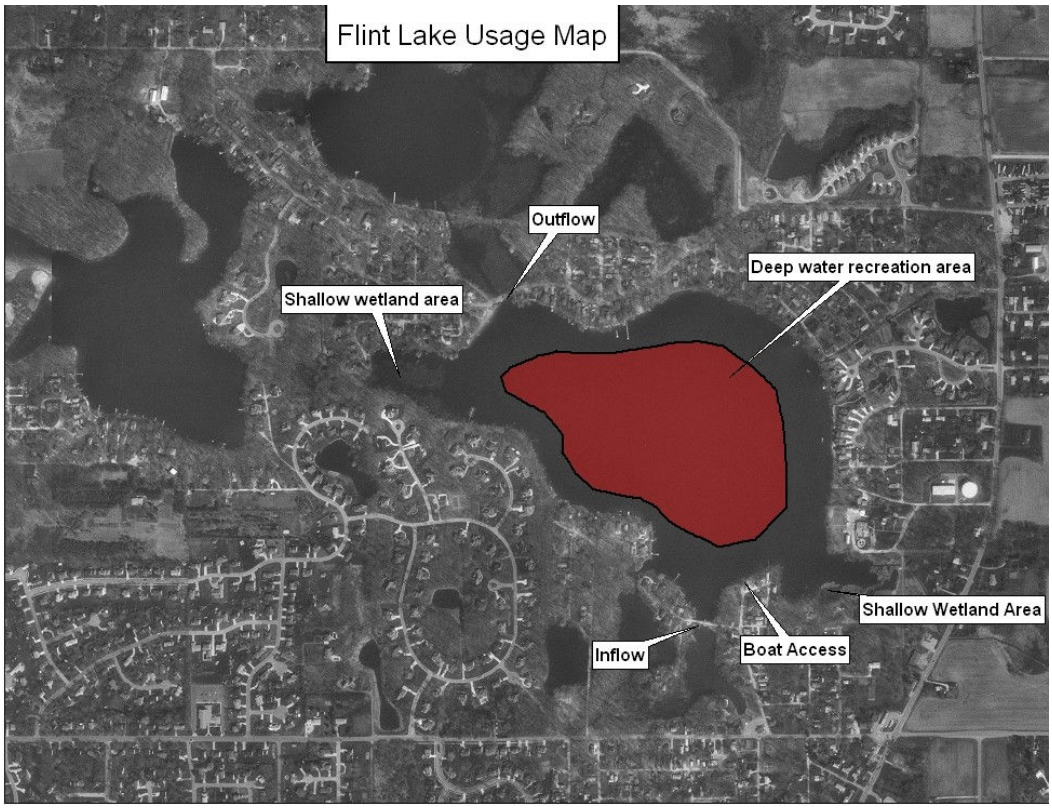

Figure 2. Flint Lake Usage Map

4.0 FISHERIES (Summarized from JFNew, 2003)

IDNR has conducted several fisheries studies over the past 38 years to assess the Valparaiso Chain of Lakes. Surveys were conducted on Flint Lake in 1976 and 1986. In general, bluegill and largemouth bass population increased from 1976 to 1986 while black crappie, redear sunfish, and northern pike populations decreased. The relative abundance of bluegill increased by almost 75% over the ten-year period between surveys and the relative abundance of harvestable bluegill more than doubled. Through competition for food and habitat, the bluegill population may play a role in limiting the population growth of black crappie and redear sunfish. The relative abundance of largemouth bass collected increased substantially from 1976 to 1986. However, only 4% of bass were considered harvestable in 1986. A 14-inch minimum size limit on largemouth bass or 14-18 inch slot limit may increase the relative abundance and size of the lake's top predator. The decreased relative abundance of northern pike from 6.0% in 1976 to 2.8% in 1986 might be attributed to absence of age I and II year old fish in 1986. This may also indicate unsuccessful spawning in the early 1980's. Recommendations from the 1986 survey concluded that previous walleye stockings were unsuccessful and should be discontinued. The survey also recommended that the Division of Fish and Wildlife attempt to purchase land near the access site in order to construct a Public Access Site with additional parking (IDNR, 1986 & JFNew, 2003).

4.1 Aquatic Vegetation and Fish Management

Aquatic vegetation is an important component in fisheries management. Aquatic vegetation provides cover for adult and juvenile fish, supports aquatic invertebrates that are eaten by fish, and shelters small fish from predators. However, dense vegetation, especially Eurasian watermilfoil, can have negative effects of fish growth. Dr. Mike Maceina of Auburn University found that dense stands of Eurasian watermilfoil on Lake Guntersville proved to be detrimental to bass reproduction due to the survival of too many small bass. This led to below normal growth rates for largemouth bass and lower survival to age 1. Maceina found higher age 1 bass density in areas that contained no plants verses dense Eurasian watermilfoil stands (Maceina, 2001). Bluegill growth rates can also be affected by dense stands of Eurasian watermilfoil. It is well known by fisheries biologists that overabundant dense plant cover gives bluegill an increased ability to avoid predation and increases the survival of small young fish, which can lead to stunted growth.

5.0 PROBLEM STATEMENT

As previously mentioned, aquatic vegetation is an important component of lakes in Indiana. However, as a result of many factors, this vegetation can develop to a nuisance level. Nuisance aquatic vegetation, as used in this paper, describes plant growth that negatively impacts the present uses of the lake including fishing, boating, swimming, aesthetic, and lakefront property values. The primary nuisance species within Flint Lake is the exotic species Eurasian watermilfoil. Curlyleaf pondweed is another submersed exotic species that is present in Flint Lake and has the potential to create nuisance conditions. Purple loosestrife is an invasive exotic emergent species that was also detected in previous sampling. This species will not likely create nuisance conditions for lake users, but could have negative impacts on native wetland species in and around Flint Lake.

5.1 Problems Caused By Eurasian Watermilfoil

Eurasian watermilfoil is an exotic invasive species of submersed vegetation that was likely introduced into our region prior to the 1940's (Figure 3). This species commonly reaches nuisance levels in Indiana Lakes. Once established, growth and physiological characteristics of milfoil enable it to form a surface canopy and develop into immense stands of weedy vegetation, outcompeting most submersed species and displacing the native plant community. These surface mats can severely impair many of the functional aspects of waterbodies such as maintenance of water quality for wildlife habitat and public health, navigation, and recreation. Furthermore, a milfoil-dominated community can greatly reduce the biodiversity of an aquatic system and negatively impact fish populations (Getsinger et. al., 1997).

Figure 3. Illustration of Eurasian watermilfoil (Illustration provided by Applied Biochemist).

5.2 Problems Caused by Curlyleaf Pondweed

Curlyleaf pondweed is an invasive exotic submersed species that was likely introduced in the early 1900's. It is present in many Indiana natural lakes and manmade impoundments. Curlyleaf pondweed's wavy serrated leaves give it a rather unique appearance (Figure 4). Richardon's pondweed (*Potamogeton richarsonii*) is probably the only species that it can be easily confused with. Curlyleaf pondweed has the tendency to create dense surface mats in the spring and early summer. These mats can interfere with recreation and limit the growth of native species. Another problem associated with this species is caused by its summer die-off that tends to lead to algae blooms. The summer die-off also tends to lessen the impact of this species on lake recreation.

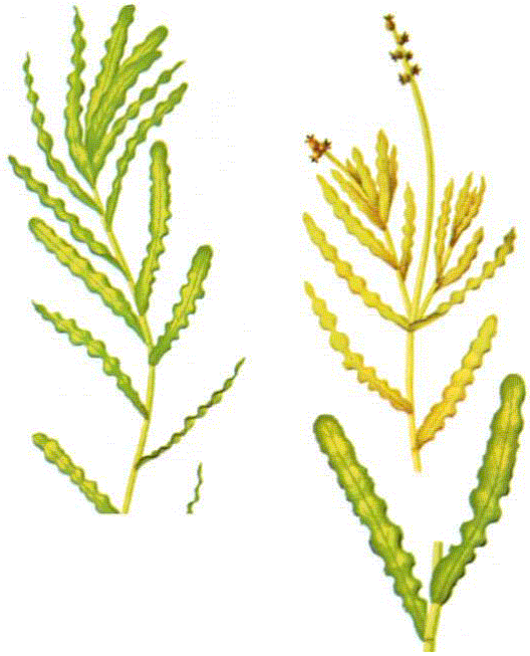

Figure 4. Illustration of curlyleaf pondweed (Illustration provided by Applied Biochemist).

5.3 Problems Caused by Purple Loosestrife

Purple loosestrife is an exotic invasive species of emergent vegetation that has invaded many wetlands and lake margins throughout Indiana (Figure 5). This species was introduced from Eurasia and became established in the estuaries of northeastern North America by the early 1800's. The impact of purple loosestrife on native vegetation has been disastrous, with more than 50% of the biomass of some wetland communities displaced. Impacts on wildlife have not been well studied, but indicate serious reduction in waterfowl and aquatic furbearer productivity (Thompson et. al., 1987).

Figure 5. Illustration of Purple Loosestrife (Illustration provided by Applied Biochemist).

6.0 VEGETATION MANAGEMENT GOALS

An effective aquatic vegetation management plan must include well-defined goals and objectives. Listed below are three goals formulated by LARE program staff and Division of Fish and Wildlife Biologists and approved by the Valparaiso Lakes Area Conservancy District. The objectives and actions used to meet the objectives will be discussed in section 12.0. One must have a better understanding of the plant community before the objectives and actions can be discussed.

Vegetation Management Goals

1. Develop or maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality, and is resistant to minor habitat disturbances and invasive species
2. Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species.
3. Provide reasonable public recreational access while minimizing the negative impacts on plant and fish and wildlife resources.

7.0 PLANT MANAGEMENT HISTORY

Small-scale shoreline herbicide treatments have been completed for at least the last two years on Flint Lake. These treatments were financed by individual homeowners and were designed to provide relief from nuisance conditions caused by native and exotic plant species. Treatment reports from 2005 indicate that Aquatic Weed Control treated 0.23 acres of vegetation on May 28. A similar treatment was completed on May 16, 2006 to the same area by Aquatic Weed Control. Eurasian watermilfoil and curlyleaf pondweed were the most abundant species in the treatment area. It is not clear in the permit report as to what herbicide(s) were used in this treatment.

8.0 AQUATIC PLANT COMMUNITY CHARACTERIZATION

Aquatic vegetation sampling must be completed in order to create an effective aquatic vegetation management plan. Sampling provides valuable data that allows managers to accomplish several tasks: locate areas of nuisance and beneficial vegetation; monitor changes in density, abundance, and location of native and exotic species; monitor and react to changes in the overall plant community; monitor the effectiveness of management techniques; and compare the Flint Lake plant community to other populations. Prior to 2006, aquatic vegetation had been sampled on Flint Lake by several different groups with several different techniques.

Faculty and staff of Purdue University North Central have conducted several studies of the plant community within the Valparaiso Chain of Lakes. They found that species diversity varied from lake to lake, but most lakes in the chain possessed between 30-40 different species. Flint Lake and Spectacle Lake had the greatest diversity with 41-43 species present in those lakes respectively (Unpublished data presented at the March 7, 2001 VLACD meeting and cited in JFNew, 2003).

IDNR surveys have also been completed on Flint Lake. The 1986 survey found 14 different species of submersed, rooted floating, and emergent vegetation. Spatterdock (*Nuphar advena*) was the most abundant rooted floating/emergent plant. Five other species of rooted floating/emergent vegetation was also documented. Eight species of submersed vegetation were observed during the survey (IDNR, 1986).

JFNew completed plant surveys on Flint Lake in 2003. They concluded that Flint Lake supported a relatively dense rooted plant population throughout the littoral zone, particularly in depths shallower than 5 feet. The survey also found dense Eurasian watermilfoil bed, particularly near the outlet cove, west of the boat ramp, and along the developed northern edge of the lake.

In 2006, Aquatic Control Inc. completed two surveys on Flint Lake. These surveys were completed according to the LARE surveying protocol that is described below. A Tier I survey was completed on June 7 and Tier I and II surveys were completed on August 9. A table outlining the scientific and common names of the species sampled in 2006 from Flint Lake is listed on the following page.

Table 1. Scientific and Common Names of Species Sampled in 2006 from Flint Lake.

Scientific Name	Common Name
Cephalanthus occidentalis	button bush
Ceratophyllum demersum	common coontail
Ceratophyllum echinatum	prickly coontail
Hibiscus palustris	swamp rose mallow
Iris versicolor	blue flag iris
Justicia americana	water willow
Lemna minor	duckweed
Lemna triscula	star duckweed
Myriophyllum sibiricum	northern watermilfoil
Myriophyllum spicatum	Eurasian watermilfoil
Najas flexilis	slender naiad
Nuphar variegetum	spatterdock
Nymphaea tuberosa	white water lily
Peltandra virginica	arrow arum
Potamogeton crispus	curlyleaf pondweed
Potamogeton foliosus	leafy pondweed
Potamogeton gramineus	variable pondweed
Potamogeton pectinatus	sago pondweed
Potamogeton richardsonii	Richardson's pondweed
Potamogeton zosteriformis	flatstemm pondweed
Spirodela polyrhiza	giant duckweed
Typha latifolia	common cattail
Vallisneria americana	eel grass
Wolffia spp.	watermeal
Zosterella dubia	water stargrass

8.1 Methods

8.1.1 Tier I Methods

The Tier I survey is also known as a reconnaissance survey. This method was developed to serve as a qualitative surveying mechanism for aquatic plants. This survey method serves to meet the following objectives:

1. to provide a distribution map of the aquatic plant species within a waterbody
2. to document gross changes in the extent of a particular plant bed or the relative abundance of a species within a waterbody

This survey strategy was augmented with the Tier II survey to gain more quantitative data if desired. The major advantage of this type of survey is the relatively small amount of time required to complete a survey. Prior to beginning a Tier I survey, information is gathered on the lake being surveyed. This information includes lake size, maximum depth, historical species lists, and historical Secchi depth data. The entire littoral zone (area of the lake which can grow vegetation) of the lake is briefly examined during the survey. A counter clock-wise path is taken around the littoral zone of the lake. While the boat is slowly zigzagging, aquatic plant abundances are recorded based on visual

observation. Abundance rating are based on 1-4 increments with 1 being less than 2% and 4 representing greater than 61% abundance. Rake throws are made if there is dense surface cover or if there is difficulty in visually assessing plant species. The littoral zone is broken up into individual plant beds (plant beds are defined as contiguous consistent plant communities). Vegetation cover ratings, substrate types, and canopy coverage are also determined during the survey (IDNR, 2006).

8.1.2 Tier II Methods

The Tier II survey helps meet the following objectives:

1. to document the distribution and abundance of submersed and floating-leaved aquatic vegetation
2. to compare present distribution and abundance with past distribution and abundance within select areas

The number and depth of sampling sites are selected based upon lake size and classification. Once a site was reached the boat was slowed to a stop and the coordinates were recorded on a hand-held GPS unit and later downloaded into a mapping program. A depth measurement was taken by dropping a two-headed standard sampling rake that was attached to a rope marked off in 1-foot increments (Figure 6). An additional ten feet of rope was released and the boat was reversed at minimum operating speed for a distance of ten feet. Once the rake is retrieved the overall plant abundance on the rake is scored with either a 0 (no plants retrieved), 1 (1-20% of rake teeth filled), 3 (21-99% of rake teeth filled), or 5 (100% of rake teeth filled) and then individual species are placed back on the rake and scored separately.

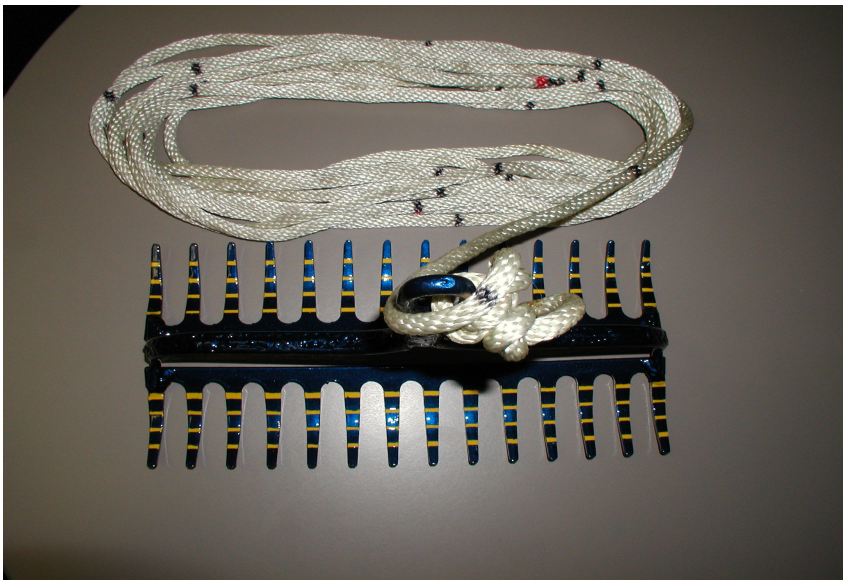

Figure 6. Sampling Rake

The data is used to calculate different lake characteristics and community and species metrics. The different characteristics and metrics calculated from the Tier II method are defined below:

Littoral depth: Maximum depth that aquatic vegetation is present.
Total sites: Total number of sites sampled.
Littoral sites: Number of sites within the littoral depth.
Secchi depth: Measurement of the transparency of water.
Species richness: count of all submersed plant species collected.
Native species richness: count of all native submersed plant species collected.
Maximum number of species per site: highest number of species collected at any site.
Mean number of species per site: The average number of all species collected per littoral site.
Mean number of native species per site: The average number of native species per site.
Species diversity index: This is a modified Simpson's diversity index which is a measure that provides a means of comparing plant community structure and stability over time.
Frequency of occurrence: Measurement of the proportion of sites where each species is present.
Relative frequency of occurrence: Measures how the plants occur throughout the lake in relation to each other.
Dominance index: Combines the frequency of occurrence and relative density into a dominance value that characterizes how dominant a species is within the macrophyte community (IDNR, 2006).

8.2 Results

8.2.1 2006 Spring Survey

On June 7, 2006, Aquatic Control completed a Tier I survey on Flint Lake. A Secchi measurement was taken and found to be 12.0 feet. The Tier I survey revealed 16 distinct plant beds within Flint Lake totaling 30.7 acres. (Table 2 & Figure 7). Ten different species were observed.

Table 2. Flint Lake Tier I Survey Results, June 7, 2006

Lake: Flint	Number of plant beds: 16															
Date: 6/7/06	Number of species: 10															
Secchi: 12'	Littoral zone size: 30.7															
Plant Bed I.D.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Plant Bed Size (acres)	**4.5**	**1.0**	**0.5**	**1.7**	**1.9**	**0.3**	**1.0**	**3.9**	**3.0**	**0.5**	**3.2**	**3.5**	**3.6**	**1.0**	**1.0**	**0.1**
spatterdock	3	-	-	-	-	-	-	-	-	3	-	-	-	-	-	4
white water lily	2	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
northern watermilfoil	2	2	-	3	-	-	2	-	-	-	2	2	2	-	-	-
common coontail	2	2	3	3	3	-	2	-	-	-	-	-	2	-	-	-
flatstem pondweed	2		3	-	-	-	-	4	2	2	4	3	2	-	3	-
sago pondweed	-	3	-	-	2	-	-	3	-	-	-	-	-	-	-	-
Richardson's pondweed	-	-	-	-	1	3	3	2	2	-	-	3	3	3	-	-
eel grass	-	-	-	-	2	-	-	-	-	-	-	-	2	3	3	-
curlyleaf pondweed	-	-	-	-	1	3	-	2	2	-	1	-	2	-	-	-
Eurasian watermilfoil	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-

*Rating based on score of 1-4 with 1 being least dense and 4 being most dense

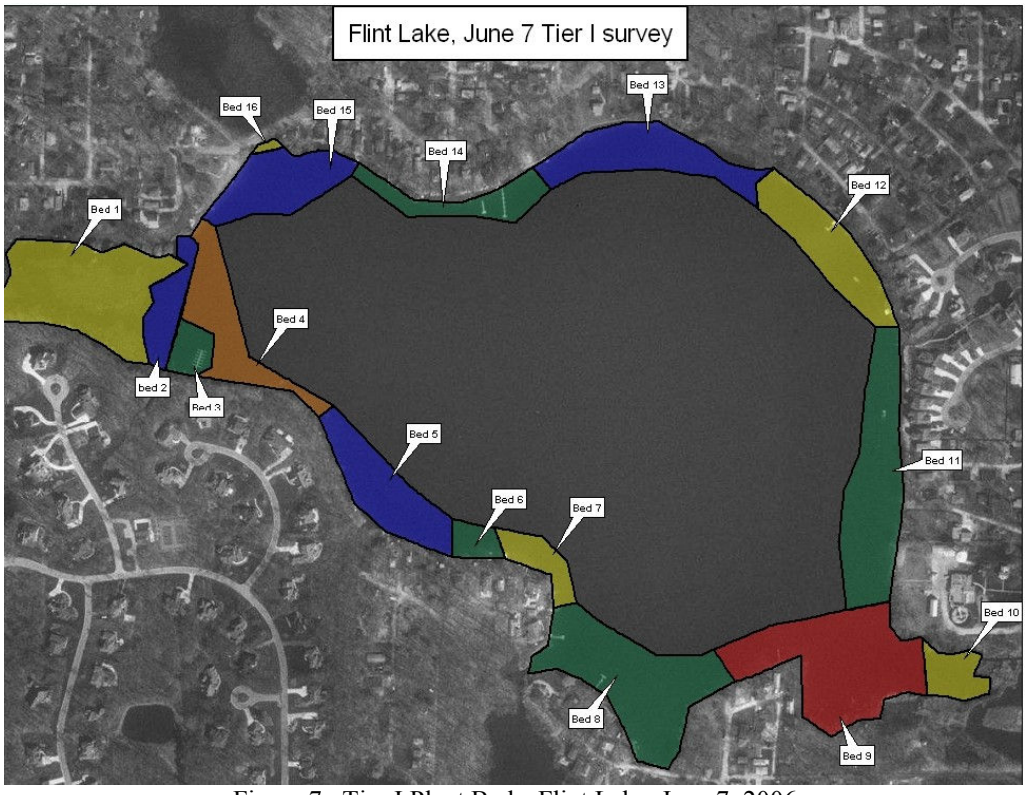

Figure 7. Tier I Plant Beds, Flint Lake, June 7, 2006

Northern watermilfoil (*Myriophyllum sibiricum*), flatstem pondweed (*Potamogton zosteriformis*), common coontail (*Ceratophyllum demersum*), and Richardson's

pondweed (*Potamogeton richardsonii*) were common submersed species. Spatterdock was the most common rooted floating species.

Curlyleaf pondweed was dense in plant bed 6 and present in plant beds 5, 8, 9, 11, and 13. Eurasian watermilfoil was only observed in plant bed 8 with an abundance rating of 2.

8.2.2 2006 Summer Survey

On August 9, 2006, a second round of sampling was completed. Sampling consisted of a Tier I and Tier II survey.

Summer Tier I survey

The Tier I survey was completed prior to a Tier II survey. A Secchi measurement was taken prior to the survey and found to be 8.5 feet. The Tier I survey revealed 11 distinct plant beds containing twenty-three different species totaling 45.2 acres. (Table 3 & Figure 8). Vegetation was present to a maximum depth of 17.0 feet.

Table 3. Flint Lake Tier I Survey Results, August 9, 2006.

Lake Name: Flint			**Number of plant beds: 11**								
Date: 8/9/06			**Number of species: 23**								
Secchi: 8.5			**Littoral zone size: 45.2**								
			Littoral zone max depth: 17.0'								
Plant Bed I.D.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Plant Bed Size (acres)	**5.0**	**19.3**	**4.2**	**0.5**	**2.1**	**0.2**	**5.6**	**4.8**	**2.7**	**0.7**	**0.7**
variable pondweed	3	1	1	2	3	-	-	-	3	2	1
common coontail	2	2	-	-	-	3	3	-	1	2	-
Richardson's pondweed	2	2	1	2	-	-	-	-	1	-	-
eel grass	2	2	1	2	2	-	1	-	3	2	-
Eurasian watermilfoil	1	4	-	2	2	1	3	-	1	3	-
northern watermilfoil	1	1	-	-	-	-	2	-	1	1	-
water stargrass	1	-	-	-	-	-	-	1	-	-	-
white water lily	-	1	2	-	1	-	-	1	1	-	2
flatstem pondweed	-	1	-	-	-	-	-	1	-	-	-
spatterdock	-	-	4	-	-	3	-	4	-	-	4
slender naiad	-	-	1	-	-	-	-	-	-	-	-
sago pondweed	-	-	1	-	1	-	-	-	-	-	-
common cattail	-	-	2	-	-	1	-	-	-	-	-
watermeal	-	-	-	-	-	1	-	1	-	-	1
common duckweed	-	-	-	-	-	1	-	1	-	-	1
star duckweed	-	-	-	-	-	1	-	1	-	-	1
swamp rose mallow	-	-	-	-	-	1	-	1	-	-	-
arrow arum	-	-	-	-	-	1	-	2	-	-	2
willow spp.	-	-	-	-	-	-	-	1	-	-	-
button bush	-	-	-	-	-	-	-	1	-	-	-
leafy pondweed	-	-	-	-	-	-	-	1	-	-	-
giant duckweed	-	-	-	-	-	-	-	1	-	-	-
blue flag iris	-	-	-	-	-	-	-	-	1	-	-

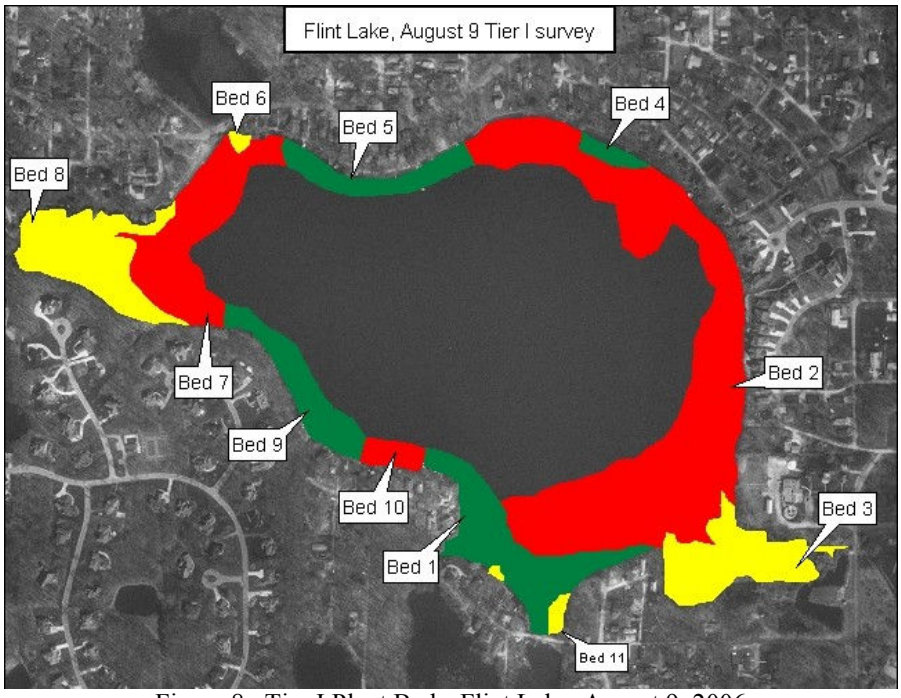

Figure 8. Tier I Plant Beds, Flint Lake, August 9, 2006

There were more species observed during the summer survey, but that may have been due to the fact that a different biologist completed the survey (the detail put into a Tier I survey is still somewhat left to the interpretation of the individual). Eurasian watermilfoil was much more abundant during the summer survey than the spring survey. Eurasian watermilfoil had an abundance rating of 3 or higher in beds 2, 7, and 10. These beds encompassed an area of 25.6 acres. Eurasian watermilfoil was present, but at a lower density, in beds 1, 4, 5, 6, and 9. It appeared that the exotic Eurasian watermilfoil had replaced the native northern milfoil. Common coontail, Richardson's pondweed, and eel grass (*Valisneria americana)* were all common submersed species during the summer survey.

Plant bed 3 and 8 were the primary areas of rooted floating and emergent vegetation. Spatterdock was the most abundant species in these beds. These beds provide many benefits to the overall health of the Flint Lake ecosystem and should be protected.

Summer Tier II survey
Tier II sampling took place on August 9, 2006 immediately following Tier I sampling. Plants were present to a maximum depth of 17.0 feet. Forty sites were selected within the littoral zone. The number and depth of the sites was determined prior to the survey and based on lake size and trophic status. Ten sites were sampled from 0-5 feet, 5-10 feet, 10-15 feet, and 15-20 feet (due to plants only being present to a depth of 17.0 feet, future sampling should be conducted no deeper than 17.0 feet). Results of the sampling are listed in Table 3. Overall vegetation density and abundance is illustrated in Figure 9. A total of 15 species were collected of which 14 of the species were natives. The maximum

number of species collected at a site was 8 and the mean species collected per site was 3.13 while the mean number of native species collected per site was 2.65.

Table 4. Occurrence and abundance of submersed aquatic plants in Flint Lake, August 9, 2006.

Occurrence and abundance of submersed aquatic plants in Flint Lake						
County: Porter		Sites with plants: 36			Mean species/site: 3.13	
Date: 8/9/2006		Sites with native plants: 36			Standard error (ms/s): 0.28	
Secchi (ft): 8.5		Number of species: 15			Mean native species/site: 2.65	
Maximum plant depth (ft): 17		Number of native species: 14			Standard error (mns/s): 0.25	
Trophic status Mesotrophic		Maximum species/site: 8			Species diversity: 0.87	
Total sites: 40					Native species diversity: 0.85	
All depths (0 to 20 ft)	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
coontail	80.0	20.0	5.0	15.0	60.0	55.0
Eurasian watermilfoil	47.5	52.5	2.5	5.0	40.0	21.5
eel grass	42.5	57.5	2.5	10.0	30.0	18.5
northern milfoil	35.0	65.0	2.5	2.5	30.0	12.0
variable pondweed	22.5	77.5	0.0	7.5	15.0	5.5
flatstemmed pondweed	17.5	82.5	0.0	2.5	15.0	4.5
water stargrass	17.5	82.5	2.5	2.5	12.5	5.5
Chara	15.0	85.0	0.0	5.0	10.0	4.0
leafy pondweed	12.5	87.5	5.0	0.0	7.5	3.5
slender naiad	7.5	92.5	0.0	0.0	7.5	1.5
Richardson's pondweed	7.5	92.5	0.0	0.0	7.5	3.5
variable watermilfoil	2.5	97.5	0.0	0.0	2.5	0.5
Nitella	2.5	97.5	0.0	0.0	0.0	0.5
sago pondweed	2.5	97.5	0.0	0.0	2.5	0.5
prickly coontail	2.5	97.5	0.0	0.0	2.5	0.5
unidentifiable pondweed	2.5	97.5	0.0	0.0	2.5	0.5
Depth: 0 to 5 ft	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
eel grass	80.0	20.0	40.0	40.0	0.0	36.0
coontail	70.0	30.0	40.0	20.0	10.0	26.0
variable pondweed	70.0	30.0	40.0	30.0	0.0	18.0
Chara spp.	40.0	60.0	20.0	20.0	0.0	12.0
Eurasian watermilfoil	30.0	70.0	10.0	10.0	10.0	6.0
northern milfoil	20.0	80.0	0.0	10.0	10.0	4.0
water stargrass	20.0	80.0	10.0	10.0	0.0	4.0
Nitella spp.	10.0	90.0	0.0	10.0	0.0	2.0
Richardson's pondweed	10.0	90.0	10.0	0.0	0.0	6.0
sago pondweed	10.0	90.0	10.0	0.0	0.0	2.0
Depth: 5 to 10 ft	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
coontail	100.0	0.0	0.0	0.0	100.0	80.0
Eurasian watermilfoil	90.0	10.0	0.0	0.0	90.0	46.0
northern milfoil	60.0	40.0	0.0	0.0	60.0	28.0
eel grass	60.0	40.0	0.0	0.0	60.0	28.0
water stargrass	40.0	60.0	0.0	0.0	40.0	16.0
leafy pondweed	20.0	80.0	0.0	0.0	20.0	8.0
flatstemmed pondweed	20.0	80.0	0.0	0.0	20.0	8.0
Richardson's pondweed	20.0	80.0	0.0	0.0	20.0	8.0
slender naiad	10.0	90.0	0.0	0.0	10.0	2.0
variable pondweed	10.0	90.0	0.0	0.0	10.0	2.0
Depth: 10 to 15 ft	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
coontail	100.0	0.0	0.0	10.0	90.0	84.0
Eurasian watermilfoil	60.0	40.0	0.0	0.0	60.0	32.0
northern milfoil	50.0	50.0	0.0	0.0	50.0	14.0
flatstemmed pondweed	40.0	60.0	0.0	0.0	40.0	8.0
slender naiad	20.0	80.0	0.0	0.0	20.0	4.0
Chara spp.	20.0	80.0	0.0	0.0	20.0	4.0
eel grass	20.0	80.0	0.0	0.0	20.0	8.0
variable watermilfoil	10.0	90.0	0.0	0.0	10.0	2.0
leafy pondweed	10.0	90.0	0.0	0.0	10.0	2.0
variable pondweed	10.0	90.0	0.0	0.0	10.0	2.0
prickly coontail	10.0	90.0	0.0	0.0	10.0	2.0
unidentifiable pondweed	10.0	90.0	0.0	0.0	10.0	2.0
Depth: 15 to 20 ft	**Frequency of**	**Rake score frequency per species**				**Plant Dominance**
Species	**Occurrence**	**0**	**1**	**3**	**5**	
coontail	50.0	50.0	10.0	30.0	10.0	30.0
leafy pondweed	20.0	80.0	20.0	0.0	0.0	4.0
Eurasian watermilfoil	10.0	90.0	0.0	10.0	0.0	2.0
eel grass	10.0	90.0	10.0	0.0	0.0	2.0
northern milfoil	10.0	90.0	0.0	0.0	10.0	2.0
flatstemmed pondweed	10.0	90.0	0.0	10.0	0.0	2.0
water stargrass	10.0	90.0	10.0	0.0	0.0	2.0

AQUATIC CONTROL

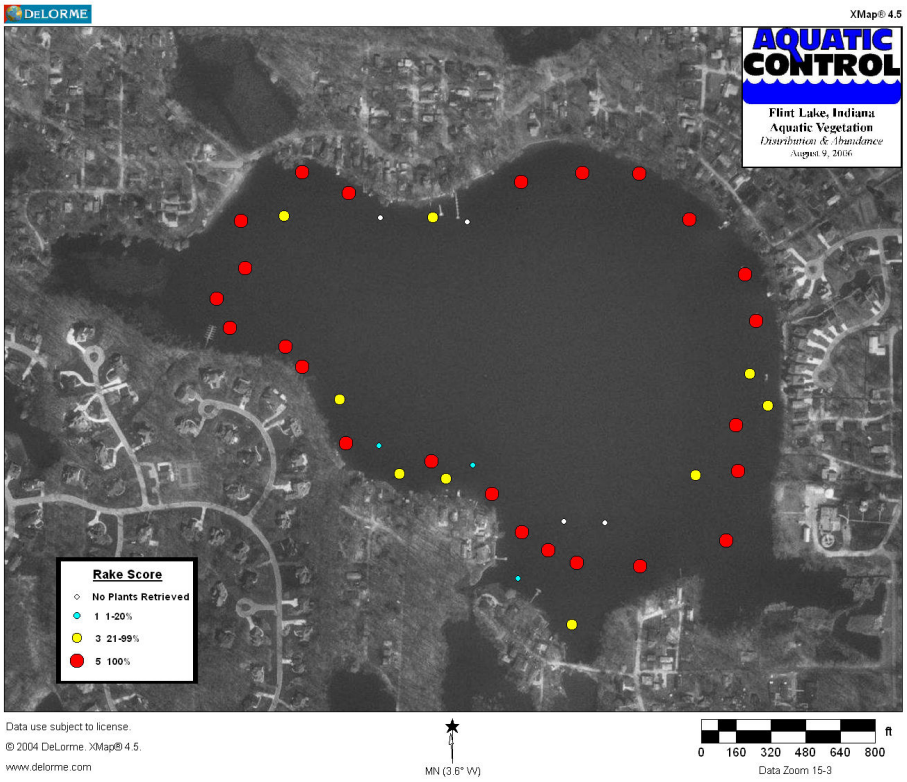

Figure 9. Flint Lake, aquatic vegetation distribution and abundance, August 9, 2006.

Common coontail was the most frequently occurring and most dominant species. Coontail was abundant at all of the depth ranges. Location and density of coontail is illustrated in Figure 10 (in species location and density figures, plant location is illustrated by a color coded dot, the color and size of the dot represents the density of the species and sample sites without that species are illustrated by smaller white diamond). Eurasian watermilfoil was the only exotic species collected. Eurasian watermilfoil was present at the second highest percentage of sample sites (47.5%) and ranked second in dominance (Figure 11). Northern watermilfoil, eel grass, and variable pondweed (*Potamogeton gramineus*) were also abundant. Eel grass was the most frequently occurring species in waters less than 5.0-feet.

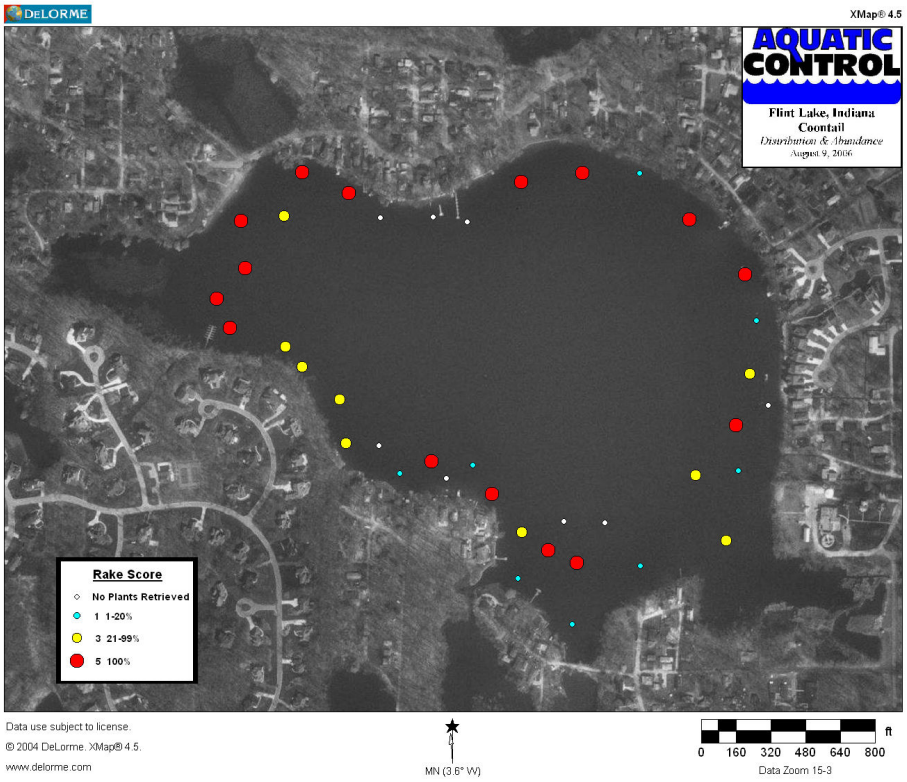

Figure 10. Flint Lake, common coontail distribution and abundance, August 9, 2006.

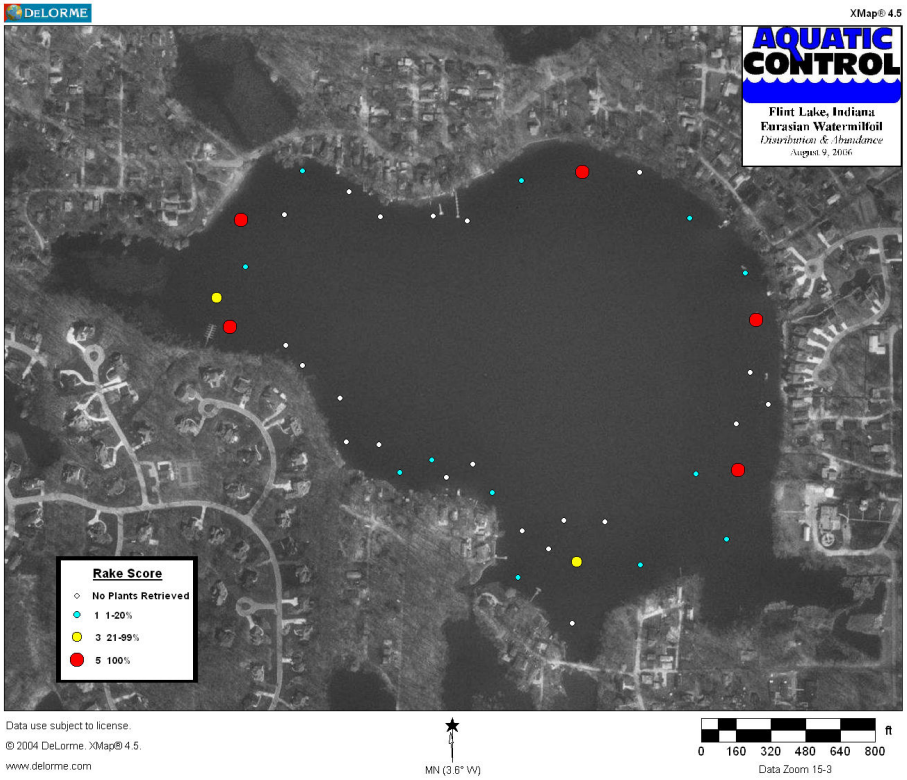

Figure 11. Flint Lake, Eurasian watermilfoil distribution and abundance, August 9, 2006.

8.3 Macrophyte Survey Discussion

According to Secchi measurements, Flint Lake has good water quality compared to other Indiana lakes, and thus a relatively diverse aquatic plant community. It also appears the water clarity has increased when compared to past measurements. Twenty-eight different aquatic species were documented in the Tier I and II surveys (even more species were documented in surveys completed by Purdue NC, likely due to a more intensive sampling technique). Large beds of eel grass, common coontail, and Richardson's pondweed were present in shallow and deep water despite the abundance of Eurasian watermilfoil. This vegetation likely provides many benefits to the overall health of Flint Lake and should be preserved. The developed shoreline was likely home to large beds of white water lily and spatterdock prior to settlement. Some small beds of rooted floating vegetation are now scattered along the around the shoreline and two larger beds remain in the northwest and southeast corners of the lake.

The presence of Eurasian watermilfoil at such high densities is the main concern for plant management in Flint Lake. This species was very dense in large areas of the lake during the summer survey and present at 47.5% of sample sites. As previously discussed, this species can lead to a wide variety of environmental and recreational problems. Control of this species should be a top priority to lake users.

Curlyleaf pondweed was abundant in several areas during the spring survey. This species was not detected during the summer sampling (curlyleaf pondweed typically reaches its maximum abundance in late spring and dies back by summer). As previously mentioned, this exotic species can have adverse affects on the ecosystem and should be closely monitored. Control of this species may become necessary once the Eurasian watermilfoil is in check.

Purple loosestrife was not detected in the 2006 survey (the 2006 survey focused primarily on submersed species, but plant samplers did make a visual observation of the emergent community and did not detect purple loosestrife). However, purple loosestrife was documented at low abundance in previous studies. Steps should be taken to keep this species at a low level.

9.0 AQUATIC PLANT MANAGEMENT ALTERNATIVES

Flint Lake contains a diverse native aquatic plant community that is beneficial to the overall quality of the lake. However, the abundance of dense beds of Eurasian watermilfoil is a cause of concern. This species can create a variety of problems if left unchecked. Eurasian watermilfoil can negatively impact native species abundance, create nuisance conditions, and also negatively effect fish populations. Once established, growth and physiological characteristics of Eurasian watermilfoil enable it to form a surface canopy and develop into immense stands of weedy vegetation, out competing most submersed species and displacing the native plant community (Madsen et al., 1988). Many effective control techniques are available for targeting this species. Curlyleaf pondweed and purple loosestrife are also species that should be considered for control.

In order to develop a scientifically sound and effective action plan for control of nuisance vegetation, all aquatic management alternatives need to be considered. The alternatives that will be discussed include: no action; institutional; environmental manipulation; mechanical control; manual control; biological control; chemical control; and any combination of these methods.

A number of different techniques have been successfully used to control nuisance vegetation. These techniques vary in terms of their efficacy, rapidity, and selectivity, as well as the thoroughness and longevity of control they are capable of achieving. Each technique has advantages and disadvantages, depending on the circumstances. Selectivity is a particularly important characteristic of control techniques. Nearly all aquatic plant control techniques are at least somewhat selective, in that they affect some plant species more than others. Even techniques such as harvesting that have little selectivity within the areas to which they are applied can be used selectively, by choosing only certain areas in which to apply them. Selectivity can also occur after the fact, as when a technique controls all plants equally but some grow back more rapidly. One facet of selecting an appropriate aquatic plant control technique is matching the selectivity of the control technique with the goals of aquatic plant management. When controlling Eurasian watermilfoil, for example, it is typically desirable to use techniques that control Eurasian watermilfoil with minimal impact on most native species (Smith, 2002).

9.1 No Action

What if no aquatic plant management activity took place on the Flint Lake? Past management practices have included herbicide treatments of selected shoreline areas. These treatments were successful for short-term control of nuisance species. Steps should be taken that provide longer-term control. If left unchecked, Eurasian watermilfoil would likely continue to spread and may increase in abundance and density. This increase would likely lead to a decrease in abundance of beneficial native species along with an increase in nuisance conditions.

9.2 Institutional-Protection of Beneficial Vegetation

Presence of beneficial vegetation can inhibit the growth of species which may be more prone to create nuisance conditions. For example, if a bed of largeleaf pondweed is controlled, that area will likely be quickly infested by Eurasian watermilfoil. Largeleaf pondweed rarely reaches the surface and if it does, it typically does not develop the density of a milfoil bed. Dense milfoil beds are impossible to boat across, difficult to fish, and provide poor habitat. On the other hand, largeleaf pondweed rarely reaches the density of Eurasian watermilfoil and provides excellent habitat for fish and aquatic invertebrates. Many associations attempt to control all vegetation. This can create a competitive advantage for aggressive species like Eurasian milfoil which can quickly colonize a controlled area. Protection of beneficial vegetation should be part of any vegetation management plan.

9.3 Environmental Manipulation

9.3.1 Water Level Manipulation

Water level manipulation refers to the raising of water levels to control aquatic vegetation by drowning or lowering to control aquatic vegetation by exposing them to freezing, drying or heat. Use of water level manipulation for aquatic plant management is limited to lake and reservoirs with adequate water control structures. Flint Lake does not have adequate water control structures, so this technique should not be considered.

9.3.2 Nutrient Reduction

Plant growth can be limited if at least one nutrient, which is critical for growth, is in short supply. Nitrogen, phosphorus or carbon are usually the nutrients limiting plant growth in lakes. Therefore, if at least one of these nutrients can be limited sufficiently so that plants do not grow to a nuisance level, this nutrient limitation can be used as a method of aquatic plant management. Generally, however, plants in northern Indiana can obtain the majority of necessary nutrients from the soil. Reduction of nutrients can actually aggravate an existing problems by increasing light penetration leading to an expansion in plant growth (Hoyer & Canfield, 1997). However, in certain situations, nutrient reduction can be effective at controlling overabundant floating vegetation or microscopic algae blooms. It appears that Flint Lake has relatively low nutrient levels, but Eurasian watermilfoil is present at high levels and creates nuisance conditions.

9.4 Mechanical Control-Harvesting, Cutting, Dredging

Mechanical control includes cutting and/or harvesting of aquatic vegetation or dredging the bottom sediments to eliminate aquatic plant growth. The main advantage to mechanical control is the immediate removal of the plant growth from control areas and the removal of organic matter and nutrients.

One of the most common mechanical control techniques used on larger lakes in Indiana is mechanical harvesting. Mechanical harvesting uses machines which cut plant stems and, in most cases, pick up the cut fragments for disposal. This type of mechanical control has little selectivity. Where a mix of Eurasian watermilfoil and native species exists, harvesting favors the plant species that grow back most rapidly following harvesting. In most cases, Eurasian watermilfoil recovers from harvesting much more rapidly than native plants. Thus, repeated harvesting hastens the replacement of native species by Eurasian watermilfoil and often leads to dense monocultures of Eurasian watermilfoil in frequently harvested areas. Harvesting also stirs up bottom sediments thus reducing water clarity, kills fish and many invertebrates, and hastens the spread of Eurasian watermilfoil via fragmentation.

Dredging of shallow areas may reduce nuisance conditions caused by vegetation in the short-term, but studies and personal experience have shown that Eurasian watermilfoil is often the first species to colonize these disturbed areas. Dredging is expensive, especially if a nearby disposal sight is not available. Careful consideration to secondary environmental effects must be considered and permits from regulatory agencies are

usually necessary before conducting dredging operations. Dredging is usually short lived if not done deeper than the photic zone.

9.5 Manual Control-Hand Pulling, Cutting, Raking

Removal of small amounts of vegetation by hand, which interfere with beach areas or boat docks, may be the only vegetation control necessary in some areas. Of course, hand removal is labor intensive and must be conducted on a routine basis. The frequency and practicality of continued hand removal will depend on availability of labor, regrowth or reintroduction potential of the vegetation, and the level of control desired (Hoyer & Canfield, 1997). Residents of Flint Lake have the option to harvest areas of submersed vegetation in and around their docks or swimming areas. Residents should keep in mind that only a 625 square foot area can be harvested without obtaining a permit from IDNR.

9.6 Biological Controls

Biological controls reduce aquatic vegetation using other organisms that consume aquatic plants or cause them to become diseased. The main biological controls for nuisance vegetation used in Indiana are the grass carp, milfoil weevil, and a variety of insects which prey upon purple loosestrife. Any use of biological controls or stocking fish in public waters in Indiana requires a permit from the IDNR Division of Fish and Wildlife.

9.6.1 Grass Carp

The grass carp (*Ctenopharyngodon idella)* is an herbivorous fish imported from Asia. Triploid grass carp, the sterile genetic derivative of the diploid grass carp, are legal for use in Indiana, but are not permitted for stocking in any natural lakes in the state. Grass carp tend to produce all or nothing aquatic plant control. It is very difficult to achieve a stocking rate sufficient to selectively control nuisance species without eliminating all submersed vegetation. They are not particularly appropriate for Eurasian watermilfoil control because this species is low on their feeding preference list; thus, they eat most native plants before consuming Eurasian watermilfoil (Smith, 2002). Grass carp are also difficult to remove from a lake once they have been stocked. Due to the legal concerns and ineffectiveness of the grass carp to correct the problem, grass carp are not recommended for nuisance vegetation control in the Flint Lake.

9.6.2 Milfoil Weevil

The milfoil weevil, *Euhrychiopsis lecontei,* is a native North American insect that consumes Eurasian and Northern watermilfoil. The weevil was discovered following a natural decline of Eurasian watermilfoil in Brownington Pond, Vermont (Creed and Sheldon, 1993), and has apparently caused declines in several other water bodies. Weevil larvae burrow in the stem of Eurasian watermilfoil and consume the vascular tissue thus interrupting the flow of sugars and other materials between the upper and lower parts of the plant. Holes where the larvae burrow into and out of the stem allow disease organisms a foothold in the plants and allow gases to escape from the stem, causing the plants to lose buoyancy and sink (Creed et al. 1992).

Concerns about the use of the weevil as a biological control agent relate to whether introductions of the milfoil weevil will reliably produce reductions in Eurasian watermilfoil and whether the resulting reductions will be sufficient to satisfy users of the lake (Smith, 2002). Following our research, no conclusive data concerning the role of weevils in reducing Eurasian watermilfoil populations has been made available. In 2003, Scribailo and Alix conducted a weevil release study on three Indiana lakes and had no conclusive evidence supporting the use of weevils in reducing milfoil populations. Weevils may reduce milfoil populations in some lakes, but predicting which lakes and how much, if any, control will be achieved has not been documented (Scribailo & Alix, 2003).

9.6.3 Purple Loosestrife Insects (Summarized from JFNew & Associates, 2005)
Some control of purple loosestrife has been achieved through the use of several insects. A pilot project in Ontario, Canada reported a decrease in 95% of the purple loosestrife population from pretreatment population (Cornell Cooperative Extension, 1996 cited in JFNew, 2005). Four different insects were used to achieve this control. These insects have been identified as natural predators of purple loosestrife in its native habitat. Insect releases in Indiana to date have had mixed results. After six years, the loosestrife of Fish Lake in LaPorte County is showing signs of deterioration. Likewise, seven years after the release at Pleasant Lake in St. Joseph County, purple loosestrife populations appear to have declined around the boat ramp (IDNR, 2004 cited in JFNew, 2005). Biological control is not a quick solution; many estimates suggest that it may take 5-15 years to achieve a large impact on purple loosestrife populations.

9.7 Chemical Control
Chemical control uses chemical herbicides to reduce or eliminate aquatic plant growth. The main disadvantage to the use of chemicals is the publics concern over safety. Extensive testing is required of aquatic herbicides to ensure that the herbicides are low in toxicity to human and animal life and they are not overly persistent or bioaccumulated in fish or other organisms. It often takes several decades of testing by the Environmental Protection Agency (E.P.A.) before a herbicide is approved for aquatic use. After E.P.A approval and registration, the herbicide must go through the registration process in each state.

Another disadvantage to the use of aquatic herbicides is water use restrictions. These restrictions must be posted prior to treatment on a public body of water. The most common restriction is irrigation. Another disadvantage to the use of herbicides is the release of nutrients that can occur if large areas of vegetation are controlled. This can be avoided by early application that controls vegetation before it reaches its maximum biomass. These perceived disadvantages are often times out-weighed by this technique's proven rapid effectiveness and selectivity.

There are two different types of aquatic herbicides, systemic and contact. Systemic herbicides are translocated throughout the plants and thereby kill the entire plants. Fluridone (trade name Sonar & Avast!), 2,4-D (trade name Navigate, Aqua-Kleen, & DMA4 IVM), and triclopyr (trade name Renovate) are systemic herbicides that can effectively control Eurasian watermilfoil. Triclopyr, imazypry, and glyphosate are systemic herbicides that can control purple loosestrife.

Based upon the author's experience and personal communication with an array of North American aquatic plant managers, whole-lake fluridone applications are by far the most effective means of controlling Eurasian watermilfoil. Successful fluridone treatments yield a dramatic reduction in the abundance of Eurasian watermilfoil, often reducing it to the point that Eurasian watermilfoil plants are difficult to detect following treatment (Smith, 2002). An advantage to using fluridone over most contact herbicides is its selectivity. Most strains of Eurasian watermilfoil have a lower tolerance to fluridone than the majority of native species, so if the proper rates are applied Eurasian water milfoil can be controlled with little harm to the majority of native species.

Aquatic Control has completed whole lake fluridone treatments on two public natural lakes in Indiana. Webster Lake was treated in 1999 and 2002. Re-infestation of Eurasian watermilfoil happened in three years, but that is because this species was present in the immediate watershed (lakes that contained Eurasian watermilfoil in the immediate watershed were not permitted for treatment). Wolf Lake, a 451-acre lake in northwest corner of Indiana, was treated with fluridone in 2004 and no Eurasian watermilfoil has been detected since the treatment. The long-term success of a fluridone treatment is variable from lake to lake. Since milfoil can spread by fragmentation, success of the treatment is dependent on eliminating all of the plants from the watershed.

Triclopyr is a systemic herbicide that has recently been approved for use in aquatics. Triclopyr typically is used for treating isolated milfoil beds as opposed to whole lake treatments. This herbicide is very selective to Eurasian watermilfoil. A study was conducted in 1997 during the registration process of this herbicide. The study found Eurasian watermilfoil biomass was reduced by 99% in treated areas at 4 weeks post-treatment, remained low one year later, and was still at acceptable levels of control at two years post-treatment. Non-target native plant biomass increased 500-1000% by one year post-treatment, and remained significantly higher in the cove plot at two years post-treatment. Native species diversity doubled following herbicide treatment, and the restoration of the community delayed the re-establishment and dominance of Eurasian watermilfoil for three growing seasons (Getsinger et. al., 1997). Triclopyr is a good alternative to fluridone when Eurasian watermilfoil is not abundant throughout an entire water body. It would likely be impossible to completely eliminate Eurasian watermilfoil with this type of herbicide, but an aggressive treatment program could significantly reduce milfoil density and abundance to a more manageable level. Eurasian watermilfoil must be treated everywhere it is located in the lake. The only water use restriction following a triclopyr treatment is irrigation. An assay is needed to monitor the concentration in the water before irrigation can take place. One of the drawbacks to

using triclopyr has been the fact that only a liquid formulation has been available. This can dramatically increase costs for treatment in deep water areas. In 2007, a granular formulation called Renovate OTF should be approved for aquatic use in Indiana.

Applied properly, 2,4-D can also yield major reductions in the abundance of Eurasian watermilfoil. Much like triclopyr, treatments must be even and dose rates accurate. This formulation should be used much like Triclopyr. Unlike Triclopyr, 2,4-D can impact the native species coontail. This herbicide can be applied for less cost than triclopyr, but damage will likely occur to coontail. 2,4-D herbicide should be considered as an alternative to triclopyr applications if the Association's budget is restricted. 2,4-D is also available in liquid and granular formulations.

Contact herbicides can also be effective for controlling submersed vegetation in the short term. The three primary contact herbicides used for control of submersed vegetation are diquat (trade name Reward), endothal (trade name Aquathol), and copper based formulations (trade names Komeen, Nautique, and Clearigate).

Historically, a drawback to the use of contact herbicides has been the lack of selectivity exhibited by these herbicides. However, a study completed by Skogerboe and Getsinger in 2002 outlines how endothal can be used for control of the exotic species curlyleaf pondweed and Eurasian watermilfoil with little effect on the majority of native species. They found early season treatments with endothall effectively controlled Eurasian watermilfoil and curlyleaf pondweed at several application rates with no regrowth eight weeks after treatment. Sago pondweed, eel grass, and Illinois pondweed biomass were also significantly reduced following the endothall application, but regrowth was observed at eight weeks post-treatment. Coontail and elodea showed no effects from endothall at three of the lower application rates. Spatterdock, pickerelweed, cattail, and smartweed were not injured at any of the application rates (Skogerboe & Getsinger 2002). This type of treatment strategy could be applied to lakes that have large areas of both curlyleaf pondweed and Eurasian watermilfoil. Endothal could also be effective the year after whole lake sonar treatments where curlyleaf pondweed typically returns the following season.

Diquat and many of the copper formulations are effective fast acting contact herbicides. These formulations are typically used when control of all submersed vegetation is desired. These herbicides are commonly used for control of nuisance vegetation around docks and near-shore high-use areas. Diquat and the copper based herbicides are not as selective as many of the other herbicides and plants can often times recover in 4-8 weeks after treatment. There are no water use restrictions following the use of chelated copper based herbicide, which makes them popular choices for lakes used for irrigation or drinking water.

10.0 PUBLIC INVOLVEMENT

An effective aquatic vegetation management plan must include input from lake users. A public meeting was conducted on September 18, 2006 at the Flint Lake Church of Christ.

The meeting was advertised in the local newspaper and on the VLACD website. Approximately twelve individuals attended the meeting.

The goals of the meeting were as follows:

1. Inform lake users of the planning process
2. Document important high-use areas of the lake
3. Educate those in attendance on aquatic plant ecology
4. Describe results of the plant sampling
5. Discuss plant management alternatives
6. Discuss implementation of the potential management strategies and monitoring programs
7. Obtain user input by filling out a survey (see appendix for survey form)

According to surveys forms, 50% of those in attendance were property owners on Flint Lake. Fifty percent of those surveyed used the lake for boating and fishing, 42% for swimming, and none of those surveyed used the lake for irrigation. On survey questions concerning lake problems; 67% believed there were too many aquatic plants, 17% thought dredging was needed, 8% believed there were too many boats with access, 8% of those surveyed believed there were not enough plants, none thought there was a fish population problem, 8% believed there was a water quality problem, and 17% believed that too many jet ski's was a problem. On survey questions dealing with aquatic vegetation; 100% believed vegetation interfered with lake use, 67% believed it affected property value, 67% believed vegetation was at a nuisance level, and 100% were in favor of continuing vegetation control efforts.

11.0 PUBLIC EDUCATION

In order to effectively manage aquatic vegetation lake users must gain an understanding of the ecology of the lake ecosystem and the effects individual actions may have on this resource. The Valparaiso Lakes Area Conservancy District should be commended on their efforts to understand and improve the lakes and surrounding watershed. Numerous studies and activities have been commissioned by VLACD. However, it is still important to continue education efforts in order to reinforce many of the actions that have been recommended by these studies. The following is a list of potential actions that individuals can undertake:

1. Reduce the frequency and amount of fertilizer, herbicide, or pesticide used for lawn care.
2. Use only phosphorus-free fertilizer.
3. Consider re-landscaping lawn edges, particularly those along the watershed's lakes, to include low profile prairie species that are capable of filtering runoff water better than turf grass
4. Consider resurfacing concrete or wooden seawalls with glacial stone, then planting native emergent vegetation along shorelines or in front of resurfaced or existing concrete or wooden seawalls to provide fish and invertebrate habitat and dampen wave energy.
5. Keep organic debris like lawn clipping, leaves, and animal waste out of the water

6. Examine all drains that lead from roads, driveways, and rooftops to the watershed
7. Obey speed limits through the lakes
8. Clean all plant fragments and sediment from boats, propellers, and trailers after lake use and refrain from dumping bait buckets into the lake to prevent the spread of exotic species (JFNew, 2005). Additional information on stopping the spread of exotic species can be found at www.protectyourwaters.net.

These points should be reinforced annually at VLACD meetings, in newsletters, and on the website.

12.0 INTEGRATED MANAGEMENT ACTION STRATEGY

The focus of the action strategy should be designed to meet the goals and objectives of the aquatic plant management plan. To review, the goals are as follows:

1. Develop or maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality, and is resistant to minor habitat disturbances and invasive species
2. Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species.
3. Provide reasonable public recreational access while minimizing the negative impacts on plant and fish and wildlife resources.

Each goal, along with objectives to meet this goal, is listed below. Following each objective are the actions which should be taken in order to achieve the objective.

12.1 Goal #1-Maintain Stable and Diverse Native Population

The first goal focuses on developing or maintaining a stable, diverse aquatic plant community. In order to address the objectives for meeting this goal the plant community will be divided into two categories: emergent/floating vegetation and submersed vegetation. The focus of the LARE program is primarily on control of nuisance exotic submersed vegetation, but seeing how this is an aquatic vegetation management plan one cannot ignore the emergent and rooted floating plant community.

Objective 1: Maintain and Enhance Diversity of the Rooted Floating/Emergent Aquatic Plant Community

There are only two areas of significant rooted floating and emergent vegetation remaining in Flint Lake. These areas are located in the southeast and northwest corners of the lake. This community serves several beneficial purposes to Flint Lake that includes reducing erosion, providing fish and wildlife food and habitat, and filtering excessive nutrients. These plant communities should be protected from development. The majority of Flint Lake's shoreline is developed and much of the shoreline is lined with seawalls. Seawalls are somewhat effective at reducing erosion, but they also eliminate a very ecologically important area of the lakes ecosystem and increase wave action in the lake. New developments should consider natural shorelines that allow emergent and rooted floating

vegetation to grow. A dense shallow water plant community should help reduce erosion, prevent geese from entering and exiting the lake, provide cover for fish and wildlife, and help filter nutrients that may enter the lake from developed sites. If erosion is still a problem, glacial stone is the recommended as a replacement for rip-rap or concrete. Figure 12 is an example of a developed shoreline on Crooked Lake in Steuben County. This home site has allowed native vegetation to flourish along their shoreline yet still has good lake access.

Figure 12. Crooked Lake, emergent plant community along developed shoreline, June 2006.

In previous surveys, purple loosestrife was found at low levels within the remaining emergent plant beds surrounding Flint Lake. This plant has the potential to spread and displace beneficial native species. To date the LARE program has not funded control of this plant, so it is important that residents take action in securing funds from other sources and conduct their own controls. Residents should become familiar with this species and dig it up if it is found on their property. Biological controls show a lot of promise and are less expensive and controversial than herbicide applications (there are a lot of issues with applying herbicides on private property as opposed to treating the water which is public property). The association should stay abreast of any funding or studies being completed with these biological controls and make all attempts to secure funds.

Objective 2: Maintain density and diversity of submersed vegetation.
Flint Lake has a relatively good density and diversity of submersed vegetation. This vegetation provides fish cover, filters nutrients, and is vital to the overall ecology of Flint Lake. Lake users need to be educated on the benefits of this vegetation. Native

vegetation should only be controlled where it is obviously negatively impacting lake use. Residents should keep in mind that a few native plants around a dock area do not negatively impact lake use. Reduction in Eurasian watermilfoil should also reduce competition with native vegetation. Once the milfoil is controlled native plants should increase in abundance.

12.2 Goal #2-Reduce Negative Impacts Caused by Exotic Vegetation

The second goal of the vegetation management plan is to prevent and reduce negative impacts of aquatic invasive species. Goal one and two are somewhat related because one of the negative impacts of invasive species is their tendency to displace beneficial native vegetation.

Objective 1: Reduce and Control Eurasian watermilfoil density and abundance

One of the main invasive species of concern is Eurasian watermifilfoil. Eurasian watermilfoil reproduces through fragmentation and can rapidly reach nuisance levels. This makes it of special concern when it comes to aquatic plant management. This species can also displace native vegetation due to this rapid growth and its tendency to form a canopy shading out native species.

Whole lake fluridone treatments have historically been the best method for long-term control of Eurasian watermilfoil. This technique is not ideal for Flint Lake since there is an abundance of Eurasian watermilfoil in other lakes that are connected to Flint. The benefits of a whole lake treatment would likely be short-lived. The costs of a whole lake treatment would likely outweigh the benefits.

It is the author's opinion that the best action plan for controlling Eurasian watermilfoil in Flint Lake involves the use of Renovate herbicide (active ingredient triclopyr). This action will be very selective towards Eurasian watermilfoil and has the potential to provide long-term control. Another advantage to the use of triclopyr for the control of Eurasian watermilfoil is that it will not harm some of the beneficial native plants such as coontail. In order to effectively complete this treatment, areas containing Eurasian watermilfoil will have to be mapped out prior to treatment. All areas containing Eurasian watermilfoil should be treated in late spring, following creation of a treatment map. These areas should be treated with 1.25-1.5 ppm of triclopyr. Treatments will likely need to be repeated the following season due to the difficulty in finding and controlling all milfoil plants and due the presence of this species in other connected lakes. However, the abundance of this species should be significantly reduced in following years. The goal of this control is to keep Eurasian watermilfoil frequency of occurrence below 5% so that the Conservancy can easily fund future controls. Based on last season's sampling, approximately 26 acres will require treatment (Figure 13). Non-turf irrigation will be the primary water-use restriction following treatment. Typically, after 7-14 days, triclopyr levels are low enough to irrigate. However, in order to be certain that these levels are low enough, an assay should be completed before irrigation is allowed. There are no swimming or fishing restrictions associated with use of this herbicide.

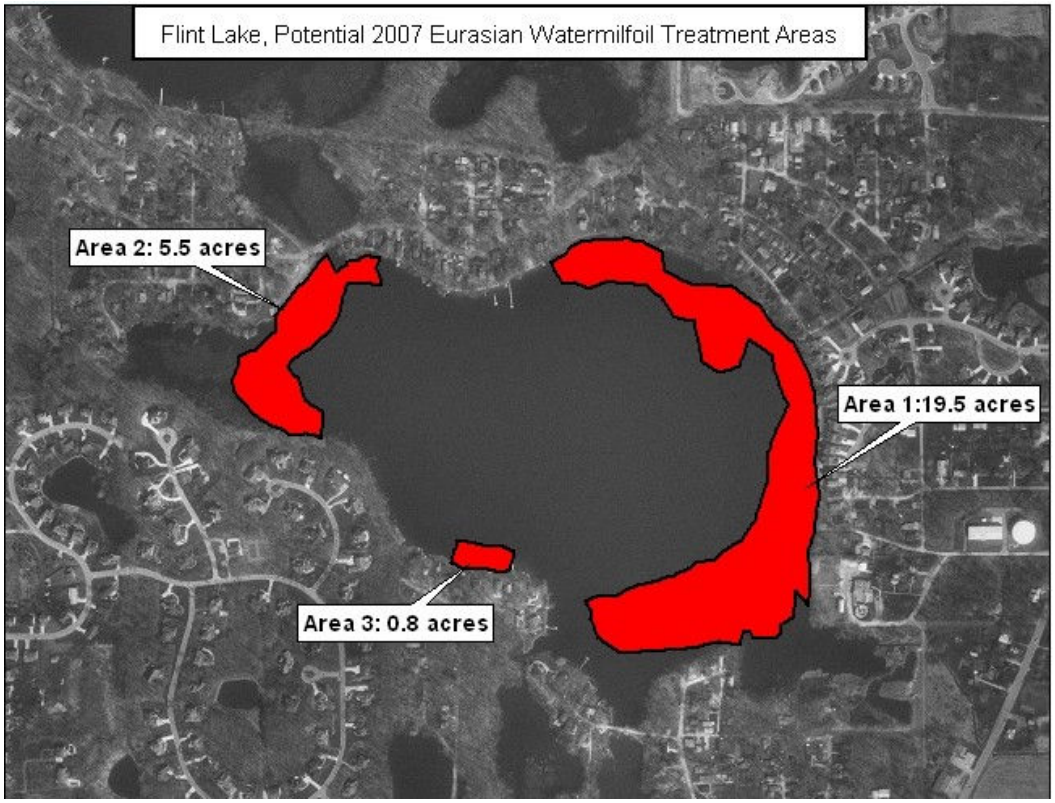

Figure 13. Flint Lake, potential Eurasian watermilfoil treatment areas.

Along with chemical control, it will be important for lake users to do their part in controlling Eurasian watermilfoil. Eurasian watermilfoil spreads through fragmentation, so it is easy to introduce this species to new areas. It is important that boaters avoid driving through any milfoil beds. This can chop up the plants causing them to float into new areas. It is also important that boaters check their props and trailers when traveling from lake to lake removing any plant fragments. One fragment of milfoil can lead to an entire colony. Signs should also be placed at all access points warning boaters to check for plant fragments. This is especially important since the discovery of hydrilla (*Hydrilla verticillata)* in Lake Manitou.

Objective 2: Prevent further spread of Purple Loosestrife

As mentioned when discussing goal number one, purple loosestrife can be detrimental to native wetland species. Control of this species will not be funded by LARE due to the extent of the problem, expense associated with control efforts, and controversy surrounding control on private property. If this species is discovered on one's property, it will be important to individual homeowners to dig up and remove the entire plant. An illustration of this species was included in Figure 5 located on page 7 of this plan.

Objective 3: Monitor curlyleaf pondweed and control if necessary

The exotic species, curlyleaf pondweed is common to northern Indiana lakes, and was found during surveys of Flint Lake. Historically, control of this species has not been funded by the LARE program due to limitations of funding that require prioritization of the most aggressive species. Curlyleaf pondweed tends to senesce during the busy summer season. After Eurasian watermilfoil is under control it may become

economically feasible to begin controlling curlyleaf pondweed. Control of this species will require multiple seasons of treatment due to the presence of curlyleaf pondweed turions, which may last several seasons after treatment. Low dose endothal treatments are effective for selective control of curlyleaf pondweed.

Objective 4: *Create public awareness of the potential for hydrilla invasion and post signs for cleaning off boats at all private and public access sites*
Hydrilla, an extremely aggressive submersed aquatic plant species, has been recently discovered in Lake Manitou, which is located in north central, Indiana. Currently, it is believed that this plant is isolated in the Lake Manitou area, but much like Eurasian watermilfoil, this species has the ability to reproduce by fragmentation. This allows it to be spread easily from lake to lake. It is very important that lake users understand the importance of thoroughly cleaning off their boats when entering and exiting Flint Lake. Posting signs at the ramp will help reinforce this point. Warnings about this plant should also be sent to members of the Association. The best way to distinguish hydrilla from native elodea is that hydrilla typically has five leaves along each whorl along with visible serrated edges along the leaf margin (Figure 14). More information about controlling the spread of hydrilla can be found at www.protectyourwaters.net. An illustration of hydrilla and native elodea follows in Figure 14.

Figure 14. Illustration of hydrilla on the left compared to native elodea on the right. Hydrilla typically contains five toothed leaves per whorl while native elodea typically has three leaves per whorl and the teeth are not visible on the leaves (Illustrations provided by Applied Biochemist).

12.3 Goal #3: Provide Reasonable Recreational Access While Minimizing the Negative Impacts on Plant, Fish, and Wildlife Resources

The focus of plant control should be on nuisance exotic species, but even if all exotic species were eliminated it may be necessary to control some native plants in order to provide access to docks and high-use areas.

Objective 1: Control vegetation around docks and the boat ramp in order to allow for boat access

If left unchecked, some homeowners may be negatively impacted by native vegetation. Some homeowners may have the ability to physically remove the vegetation from these areas (625 square feet can be removed without a permit). It is recommended that if possible, and if needed, homeowners control only 625 square feet. However, some areas may be too dense or some homeowners may not be capable of completing this task. In this case it will be necessary to contact professionals to complete the work. Applied properly, aquatic herbicides are typically the best method for control of dense vegetation growth. Treatment should be limited to near shore high-use areas. Width of shoreline treatments should not exceed 100 feet out from shore. Treatment of rooted floating vegetation should be limited to a wide enough area for boats to pass (20-30 feet). It has also been IDNR's policy to only permit treatment of native vegetation in half of the shoreline areas of any given lake.

12.4 List of Actions To Be Initiated

The purpose of the LARE grant was to fund aquatic vegetation control on public lakes. Listed below, in order of importance, are recommended actions in order to meet the goals and objectives of the aquatic vegetation management plan. Some of these actions may be funded by LARE, but many will require funds from the Association.

1. Initiate treatment of Eurasian watermilfoil in Flint Lake with Renovate herbicide. Treatment should take place in the spring of 2007 following sampling that will determine actual treatment areas. Triclpyr should be applied at 1.25-1.50 ppm. Treatment will likely be needed the following seasons and should be included in the long-term budget.
2. Monitor plant community with plant surveys for next five years in order to assess the effectiveness of controls and response of native plant community. Plant surveys will also be invaluable to quickly detect and control potential reinfestation of Eurasian watermilfoil. Surveys should consist of a spring pre-treatment survey for invasive species and a summer Tier II survey in 2007. A Tier II survey should be completed in the summer of 2008. These surveys should be continued through 2011.
3. Post signs at access sites warning boaters of the potential for invasive plant species introductions from boat trailers. Signs should implore boaters to clean trailers, props, and boats of all vegetation fragments when entering and leaving Flint Lake. Information concerning the potential spread of Eurasian watermilfoil and hydrilla should be distributed to all Conservancy members and lake users.
4. Remove purple loosestrife from individuals' property and pursue funding source to biological controls.

5. Maintain dock areas with physical plant removal when possible or by contracting professional applicators. Treatments should not exceed 100 feet from shoreline for submersed vegetation and treatment of rooted floating vegetation should be limited to boating lanes.
6. Educate lake users on best management practices in order to improve water quality.
7. Monitor curlyleaf pondweed population and consider control after Eurasian watermilfoil is reduced.

13.0 PROJECT BUDGET

Table 4 is an estimated budget for the aquatic vegetation management action plan. The majority of the initial cost will be for treatment of Eurasian watermilfoil. It is hard to predict how much milfoil will return in following years, but the estimate below is based on past experience. Plant sampling will be one of the most important actions in order to monitor the effects of the control techniques. Sampling should consist of a spring pre-treatment survey to map treatment areas along with a Tier II survey in the summer. It is proposed that IDNR fund treatment of milfoil and plant survey updates (this will require a 10% match from the Association). **It is our recommendation that the Valparaiso Lakes Area Conservancy District requests $12,000 for treatment of Eurasian watermilfoil in 2007. The Association should also request $4,000 plant sampling and plan updates.** Curlyleaf pondweed should also be monitored in years following the Renovate treatments. Curlyleaf pondweed was found in 16 acres of the lake at the time of the Tier I survey in 2006. Curlyleaf pondweed can be treated for approximately $300 per acre for a total of $4,800. Three years of monitoring and treatment should be scheduled for the treatment of curlyleaf pondweed. We recommend that a program for curlyleaf pondweed should start in 2008 after the initial Eurasian watermilfoil treatment is made. A permit has been created for the milfoil treatment and is included in the Appendix. This permit should be handled by the association and once a contractor is selected for the treatment the permit can be completed. It is possible that this project may not be fully funded due to a recent hydrilla infestation in Lake Manitou that may use a large percentage of potential LARE funds.

Table 5. Budget estimate for action plan

	2007	2008	2009	2010	2011
Treatment of curlyleaf pondweed with Aquathol K liquid herbicide	-	$4,800	$4, 800	$4,800	-
Selective treatment of Eurasian watermilfoil with Renovate herbicide	$12,000	$10,000	$8,000	$6,000	$4,000
Plant sampling and plan updates (potential LARE funding with 10% match)	$4,000	$4,000	$4,000	$4,000	$4,000
Total:	**$16,000**	**$18,800**	**$16,800**	**$14,800**	**$8,000**

*Request $16,000 from LARE program in 2007.

14.0 MONITORING AND PLAN UPDATE PROCEDURES

One of the most important actions in the aquatic vegetation management plan is the continued monitoring of the plant population. Continued monitoring will provide valuable data to the aquatic plant manager. This data can be used to complete the following tasks: allow for needed changes to be made to the plan; monitor success or failure of controls; monitor improvements or damage to native plants; and detect potential new invasive species at an early stage of infestation. In 2007, monitoring should consist of a treatment map survey in the spring along with a Tier II survey in July or August. The Tier II survey provides managers with quantitative data that can point out trends in the plant community. Each winter this data should be analyzed and included in an update to the aquatic vegetation management plan. The surveys may lead to changes in the recommended actions of the plan.

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16.0 APPENDICIES
16.1 Data Sheets

Aquatic Vegetation Plant Bed Data Sheet Page 1 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control | DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 1
Bed Size: 4.5 (+/-)
Substrate: 3
Marl?
High Organic?

Waterbody Name: Flint Lake
Waterbody ID:
Total # of Species

CanopyAbundance at Site
S: 40 N: F: 60 E: 10

SITE COORDINATES

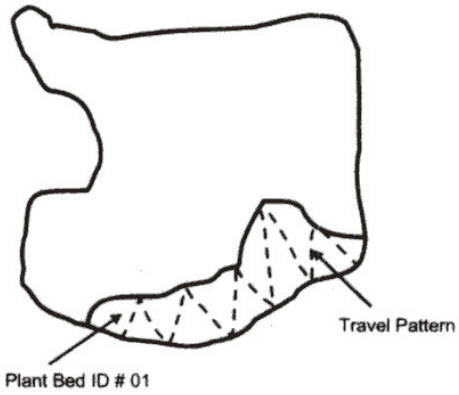
Center of the Bed
Latitude: 41° 30.892
Longitude: 87° 2.938

Max. Lakeward Extent of Bed
Latitude: 41° 30.[illegible]406
Longitude: 87° 2.897'

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
NULU	3	0	0	
NYTU	2	0	0	
MYSI	2	0	0	
CEDE4	2	0	0	
POZO	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
0 = as defined
1 = Species suspe
2 = Genus suspected
3 = Unknown

Voucher:
0 = Not Taken
1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

9

Aquatic Vegetation Plant Bed Data Sheet

Page 2 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control Inc. DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 2
Bed Size: 1 acres
Substrate: 3
Marl?
High Organic?

Waterbody Name: Flint Lake
Waterbody ID:
Total # of Species

CanopyAbundance at Site

S: 0 N: 0 F: 0 E: 0

SITE COORDINATES

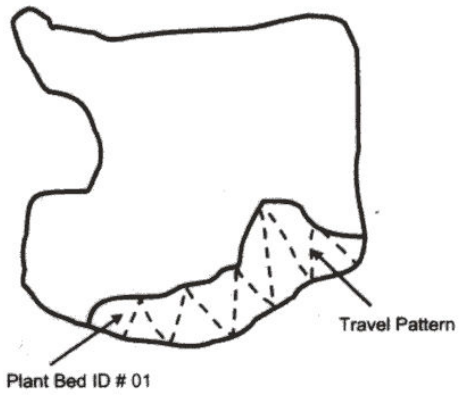
Center of the Bed
Latitude:
Longitude:

Max. Lakeward Extent of Bed
Latitude:
Longitude:

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POPE 6	3	0	0	
MYSI	2	0	0	
CEDE4	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
0 = as defined
1 = Species suspe
2 = Genus suspected
3 = Unknown

Voucher:
0 = Not Taken
1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 3 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 3

Bed Size: 0.5 acres

Substrate: 3

Marl?

High Organic?

Waterbody Name: Flint

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: 0 N: 0 F: 0 E: 0

SITE COORDINATES

Center of the Bed

Latitude: 41° 30.868

Longitude: 87° 2.873

Max. Lakeward Extent of Bed

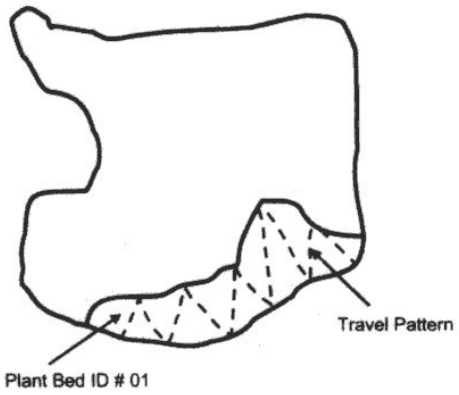
Latitude: 41° 30.853

Longitude: 87° 2.859

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POZO	3	0	0	
CEDE4	3	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
0 = as defined
1 = Species suspe
2 = Genus suspected
3 = Unknown

Voucher:
0 = Not Taken
1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 4 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 4

Bed Size: 17

Substrate: 3

Marl?

High Organic?

Waterbody Name: Flint Lake

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: N: F: E:

SITE COORDINATES

Center of the Bed

Latitude: 41° 30.585

Longitude: 87 2.865

Max. Lakeward Extent of Bed

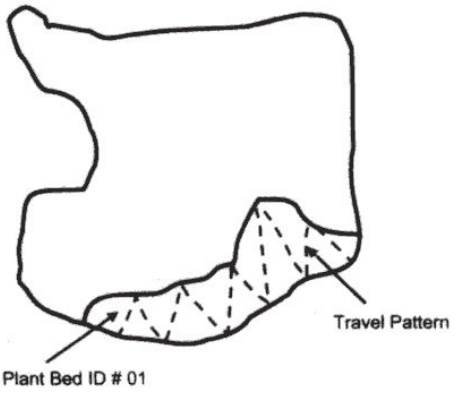
Latitude: 30.815

Longitude: 87 2.827

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
CEDE4	3	0	0	
MYSI	3	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
0 = as defined
1 = Species susp
2 = Genus suspected
3 = Unknown

Voucher:
0 = Not Taken
1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

9

Aquatic Vegetation Plant Bed Data Sheet

Page 5 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/05

SITE INFORMATION

Plant Bed ID: 5

Bed Size: 1.85

Substrate: 3

Marl?

High Organic?

Waterbody Name: Flint

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: 6 N: 0 F: 0 E: 0

SITE COORDINATES

Center of the Bed

Latitude: 41° 30.777

Longitude: 87° 2.742

Max. Lakeward Extent of Bed

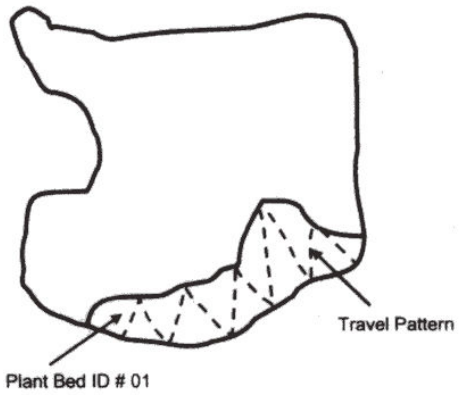
Latitude: 41° 30 786

Longitude: 87° 2.733

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
CEDE4	3	0	0	
POR12	1	0	0	
VAAM3	2	0	0	
POPE6	2	0	0	
POCR3	1			

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
0 = as defined
1 = Species susp
2 = Genus suspected
3 = Unknown

Voucher:
0 = Not Taken
1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 6 of 16

State of Indiana Department of Natural Resources

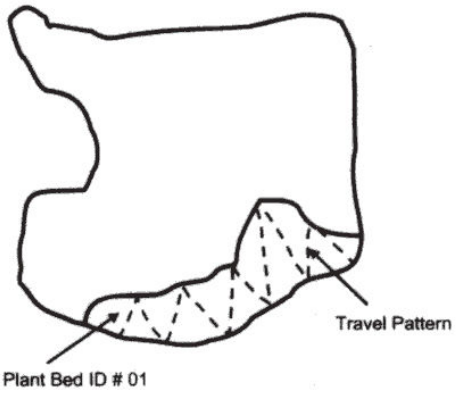
ORGANIZATION: Aquatic Control Inc. DATE: 6/7/05

SITE INFORMATION		SITE COORDINATES	
Plant Bed ID: 6	Waterbody Name: Flint	Center of the Bed	
Bed Size: ¼ acre		Latitude:	41° 30.725
Substrate: 3	Waterbody ID:	Longitude:	87° 2.679
Marl?	Total # of Species	Max. Lakeward Extent of Bed	
High Organic?	CanopyAbundance at Site	Latitude:	[redacted] 30.733
	S: 0 N: 0 F: 0 E: 0	Longitude:	[redacted] 2.678

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POCR3	3	0	0	
POR 12	3	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

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6 = Sand

Marl
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High Organic
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9

Aquatic Vegetation Plant Bed Data Sheet

Page 7 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control Inc. DATE: 6/7/05

SITE INFORMATION

Plant Bed ID: 7
Bed Size: 1 acre
Substrate:
Marl?
High Organic?

Waterbody Name: Flint
Waterbody ID:
Total # of Species

Canopy Abundance at Site

S:	N:	F:	E:

SITE COORDINATES

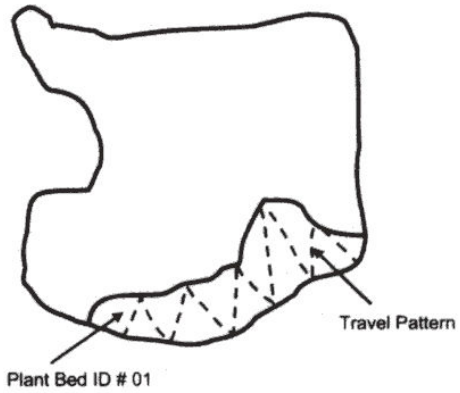
Center of the Bed
Latitude: 41° 30.723
Longitude: 87° 2.622

Max. Lakeward Extent of Bed
Latitude: 41° 30.735
Longitude: 87° 2.588

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POR 12	3	0	0	
MYSI	2	0	0	
CEDE 4	2	0	0	

Individual Plant Bed Survey



Comments:

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Substrate:
1 = Silt/Clay
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3 = Sand w/Silt
4 = Hard Clay
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6 = Sand

Marl
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0 = absent

High Organic
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0 = absent

Overall Surface Cover
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F = Floating, rooted
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Canopy:
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Abundance:
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9

Aquatic Vegetation Plant Bed Data Sheet

Page 8 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control Inc. DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 8
Bed Size: 3.94
Substrate: 3
Marl?
High Organic? 1

Waterbody Name: Flint
Waterbody ID:
Total # of Species
CanopyAbundance at Site
S: 4 N: F: E:

SITE COORDINATES

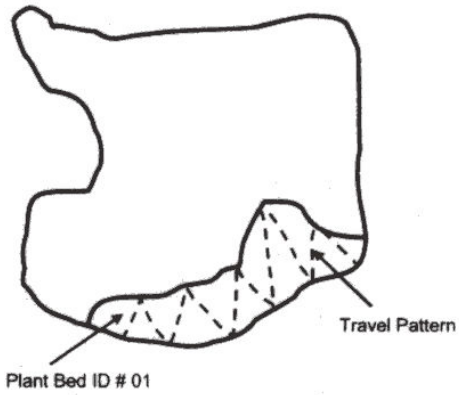
Center of the Bed
Latitude: 41 30.674
Longitude: 87 2.554

Max. Lakeward Extent of Bed
Latitude: 41 30.712
Longitude: 87 2.577

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POCR3	2	0	0	
POPS6	3	0	0	
POZO	4	0	0	
MYSP2	2	0	0	
POR12	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
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2 = 2-20%
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Abundance:
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Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 9 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 9

Bed Size: 3.05

Substrate: 3

Marl?

High Organic? 1

Waterbody Name: Flint

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: 0 N: 0 F: 0 E: 0

SITE COORDINATES

Center of the Bed

Latitude: 41 30.689

Longitude: 87 2.418

Max. Lakeward Extent of Bed

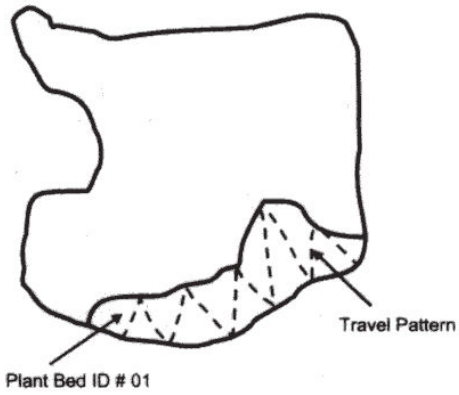
Latitude: 41 30.716

Longitude: 87 2.435

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POCR3	2	0	0	
PORI2	12	0	0	
POZO	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

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3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
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Abundance:
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Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 10 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 10

Bed Size: 0.5 acres

Substrate: 2

Marl?

High Organic? 1

Waterbody Name: Flint

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: N: F: E:

SITE COORDINATES

Center of the Bed

Latitude: 41 30.690

Longitude: 87 2.344

Max. Lakeward Extent of Bed

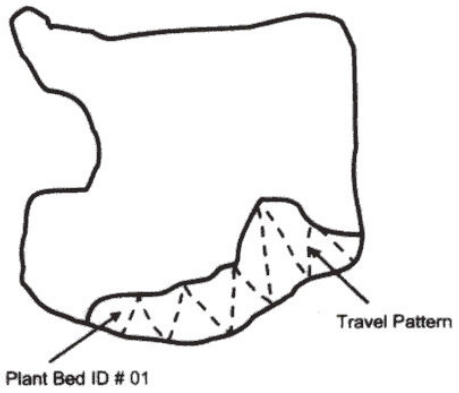
Latitude: 41 30.691

Longitude: 87 2.365

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
NyLy	3	0	0	
NYTY	3	0	0	
POZO	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
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F = Floating, rooted
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Canopy:
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Abundance:
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Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

9

Aquatic Vegetation Plant Bed Data Sheet

Page 12 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 11

Bed Size: 3.18

Substrate: 2

Marl?

High Organic?

Waterbody Name: Flint

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: 0 N: 0 F: 0 E: 0

SITE COORDINATES

Center of the Bed

Latitude: 41 30.776

Longitude: 87 2.378

Max. Lakeward Extent of Bed

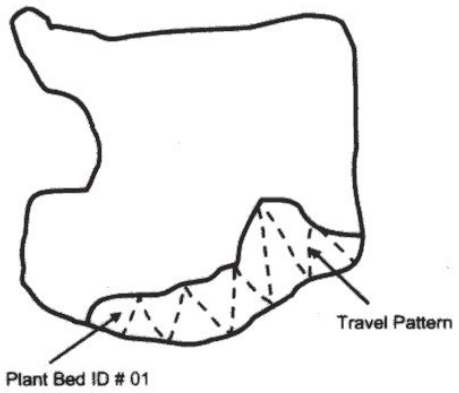
Latitude: 41 30.756

Longitude: 87 2.397

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POZO	4			
POCR3	1			
MYSI	2			

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
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2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
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2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
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2 = Genus suspected
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Voucher:
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Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

9

Aquatic Vegetation Plant Bed Data Sheet

Page 1 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control Inc

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 12

Bed Size: 3.5

Substrate: 2

Marl?

High Organic? 1

Waterbody Name: Flint

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: 0 N: 0 F: 0 E: 0

SITE COORDINATES

Center of the Bed

Latitude: 41 30.895

Longitude: 87 2.402

Max. Lakeward Extent of Bed

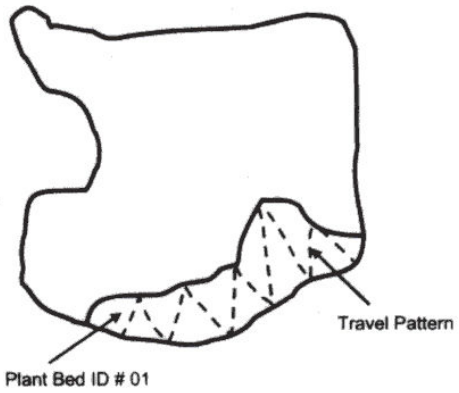
Latitude: 41 30.875

Longitude: 87 2.424

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POZO	3	0	0	
PORI2	3	0	0	
MYSI	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
0 = as defined
1 = Species susp
2 = Genus suspected
3 = Unknown

Voucher:
0 = Not Taken
1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

9

Aquatic Vegetation Plant Bed Data Sheet

Page 13 of 16

State of Indiana Department of Natural Resources

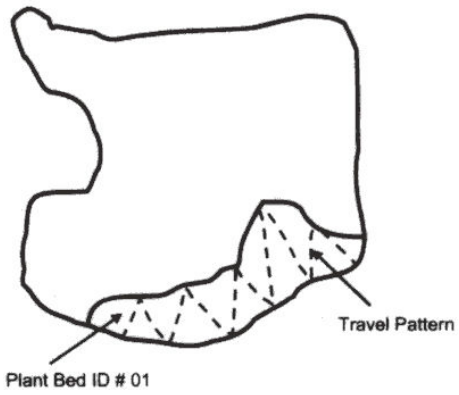
ORGANIZATION: Aquatic Control Inc. DATE: 6/7/06

SITE INFORMATION		SITE COORDINATES	
Plant Bed ID: 13	Waterbody Name: Flint	Center of the Bed	
Bed Size: 3 ac		Latitude: 41 30.960	
Substrate: 2	Waterbody ID:	Longitude: 87 2.528	
Marl?	Total # of Species	Max. Lakeward Extent of Bed	
High Organic? 1	CanopyAbundance at Site	Latitude: 41 30.940	
	S: 0 N: 0 F: 0 E: 0	Longitude: 87 2.507	

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POR12	3	0	0	
MYSI	2	0	0	
VAAM3	2	0	0	
POCR3	2	0	0	
POZO	2	0	0	
CEDE4	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
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QE Code:
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1 = Species suspe
2 = Genus suspected
3 = Unknown

Voucher:
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2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

9

Aquatic Vegetation Plant Bed Data Sheet

Page 14 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 14
Bed Size: 1 acre
Substrate: 2
Marl?
High Organic? 1

Waterbody Name: Flint
Waterbody ID:
Total # of Species

CanopyAbundance at Site

S: 0 N: 0 F: 0 E: 0

SITE COORDINATES

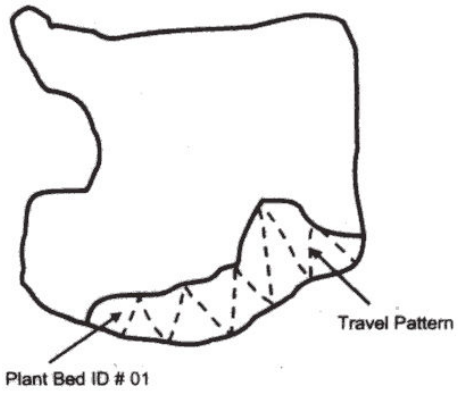
Center of the Bed
Latitude: 41 30.937
Longitude: 87 2.714

Max. Lakeward Extent of Bed
Latitude: 41 30.923
Longitude: 87 2.720

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
VAAM3	3	0	0	
POR12	3	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
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2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
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1 = Species suspe
2 = Genus suspected
3 = Unknown

Voucher:
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2 = Taken, varifie

Reference ID:
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9

Aquatic Vegetation Plant Bed Data Sheet

Page 15 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 15

Bed Size: 1 acre

Substrate: 2

Marl?

High Organic?

Waterbody Name: Flint

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: 0 N: 0 F: 0 E: 0

SITE COORDINATES

Center of the Bed

Latitude: 41 30.952

Longitude: 87 2.829

Max. Lakeward Extent of Bed

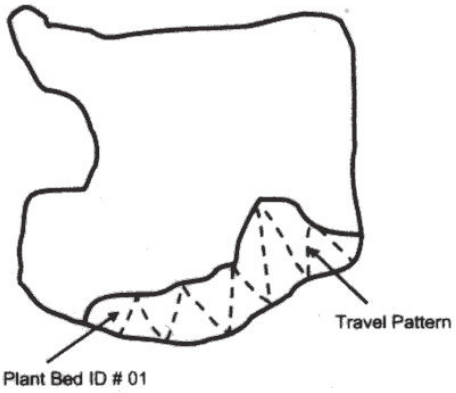
Latitude: 41 30.945

Longitude: 87 2.823

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POZO	3			
VAAM3	3			

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
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0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
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F = Floating, rooted
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Canopy:
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Abundance:
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Voucher:
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Reference ID:
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9

Aquatic Vegetation Plant Bed Data Sheet

Page 16 of 16

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 6/7/06

SITE INFORMATION

Plant Bed ID: 16

Bed Size: 3,710 sq ft

Substrate: 2

Marl?

High Organic?

Waterbody Name: Flint

Waterbody ID:

Total # of Species

CanopyAbundance at Site

S: N: F: E:

SITE COORDINATES

Center of the Bed

Latitude: 41 30.940

Longitude: 87 2.878

Max. Lakeward Extent of Bed

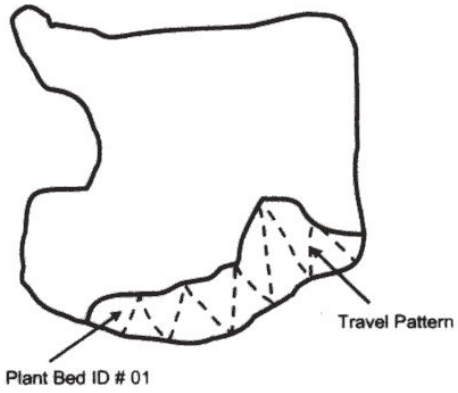
Latitude: 41 30.937

Longitude: 87 2.871

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
NuLu	4	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
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High Organic
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2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Tier 1

Aquatic Vegetation Reconnaissance Sampling

Waterbody Cover Sheet

Surveying Organization: Aquatic Control

Waterbody Name: Flint Lake ID:

County: Porter Date: 8-9-06

Habitat Stratum: 1L Ave. Lake Depth (ft): Lake Level: Norm

Crew Leader: N. Long

GPS Metadata

Datum: Nad27 Zone: 16 Accuracy: 3M

Recorder: R. Grey Method: D

Secchi Depth (ft): 8.5 Total # of Plant Beds Surveyed: 11 Total # of Species: 23

Littoral Zone Size (acres): 45.2

- [x] Measured
- [ ] Estimated

Littoral Zone Max. Depth (ft): 17.0

- [x] Measured
- [ ] Estimate (historical Secchi)
- [ ] Estimated (current Secchi)

Notable Conditions:

Aquatic Vegetation Plant Bed Data Sheet

State of Indiana Department of Natural Resources

Page 1 of 11

ORGANIZATION: Aquatic Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 1

Waterbody Name: Flint Lake

Bed Size: 5.0

Substrate: 3

Waterbody ID:

Marl? 0

Total # of Species 7

High Organic? 1

CanopyAbundance at Site

S: 1 N: 1 F: 1 E: 1

SITE COORDINATES

Center of the Bed

Latitude: N41.51061

Longitude: W 87.04325

Max. Lakeward Extent of Bed

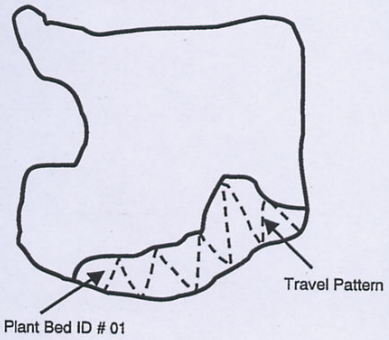
Latitude: N 41.51194

Longitude: W87.04453

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POGR	3	0	0	
CEDE4	2	0	0	
POAM	2	0	0	
VAAM3	2	0	0	
MYSP2	1	0	0	
MYSI	1	0	0	
ZODU	1	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
0 = as defined
1 = Species suspe
2 = Genus suspected
3 = Unknown

Voucher:
0 = Not Taken
1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 2 of ___

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 2
Bed Size: 19.3
Substrate: 3
Marl? 0
High Organic? 0

Waterbody Name: Flint
Waterbody ID:
Total # of Species 8

CanopyAbundance at Site

S: 3 N: 1 F: 1 E: 1

SITE COORDINATES

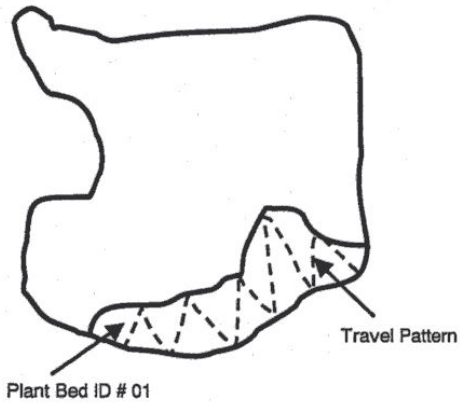
Center of the Bed
Latitude: N41.51295
Longitude: W87.03962

Max. Lakeward Extent of Bed
Latitude: N41.51433
Longitude: W87.04107

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
MYSP2	4	0	0	
MYSI	1	0	0	
CEDE4	2	0	0	
PORI	2	0	0	
UAAM3	2	0	0	
POGR	1	0	0	
MYTU	1	0	0	
POZO	1	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
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High Organic
1 = Present
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Abundance:
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Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 3 of 11

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 3
Bed Size: 4.2
Substrate: 1
Marl? 0
High Organic? 1

Waterbody Name: Flint
Waterbody ID:
Total # of Species 8

CanopyAbundance at Site

S: 1 N: 1 F: 4 E: 2

SITE COORDINATES

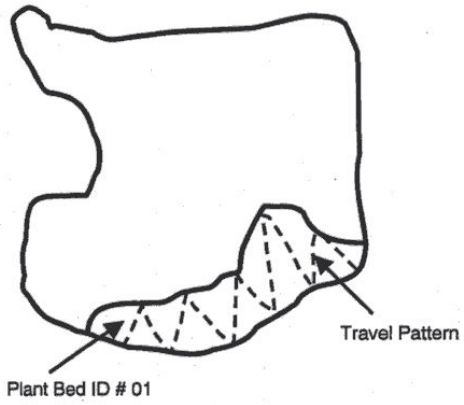
Center of the Bed
Latitude: N41.51060
Longitude: W87.03930

Max. Lakeward Extent of Bed
Latitude: N41.51133
Longitude: W87.03955

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
NULU	4	0	0	
UTU	2	0	0	
MAEL	1	1	0	
POGR	1	0	0	
PORI	1	0	0	
POPE6	1	0	0	
VAAM3	1	0	0	
TYLA	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
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0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
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E = Emergent
S = Submersed

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2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
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3 = 21-60%
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Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 4 of ___

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 4

Waterbody Name: Flint

Bed Size: 0.5

Substrate: 3

Waterbody ID:

Marl? 0

Total # of Species 4

High Organic? 0

CanopyAbundance at Site

S: 2 N: 1 F: 1 E: 1

SITE COORDINATES

Center of the Bed

Latitude: N41.51562

Longitude: W87.04148

Max. Lakeward Extent of Bed

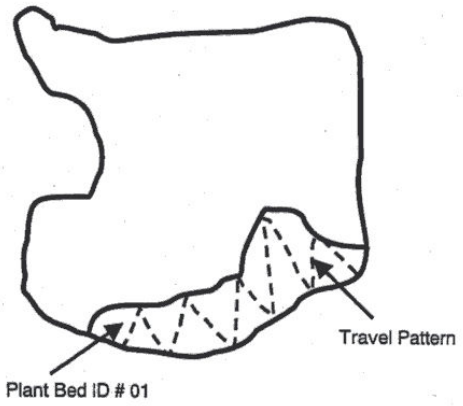
Latitude: N41.51553

Longitude: W87.04162

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
MYSP2	2	0	0	
POGR	2	0	0	
PORI	2	0	0	
VAAM3	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
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0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
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Canopy:
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Abundance:
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2 = 2-20%
3 = 21-60%
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1 = Species suspe
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3 = Unknown

Voucher:
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1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 5 of ___

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 05

Bed Size: 2.1

Substrate: 3

Marl? 0

High Organic? 0

Waterbody Name: Flint

Waterbody ID:

Total # of Species 5

CanopyAbundance at Site

S: 3 N: 1 F: 1 E: 1

SITE COORDINATES

Center of the Bed

Latitude: N41.51520

Longitude: W87.04544

Max. Lakeward Extent of Bed

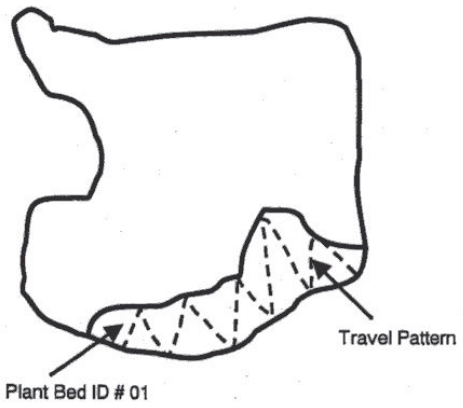
Latitude: N41.51510

Longitude: W87.04556

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POGR	3	0	0	
MYSP2	2	0	0	
VAAM3	2	0	0	
POPE6	1	0	0	
NYTU	1	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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3 = Sand w/Silt
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5 = Gravel/Rock
6 = Sand

Marl
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0 = absent

High Organic
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0 = absent

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S = Submersed

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Abundance:
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2 = 2-20%
3 = 21-60%
4 = > 60%

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2 = Genus suspected
3 = Unknown

Voucher:
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1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 6 of 11

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 6
Bed Size: 0.2
Substrate: 1
Marl? 0
High Organic? 1
Waterbody Name: Flint
Waterbody ID:
Total # of Species 9
CanopyAbundance at Site
S: 1 N: 3 F: 3 E: 1

SITE COORDINATES

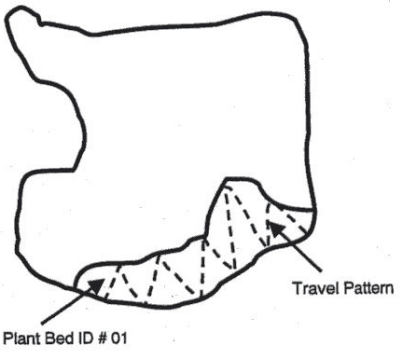
Center of the Bed
Latitude: N41.51574
Longitude: W87.04770
Max. Lakeward Extent of Bed
Latitude: N41.51562
Longitude: W87.04768

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
NULU	3	0	0	
WOCO	1	0	0	
LEMI	1	0	0	
LETR	1	0	0	
CEDE4	3	0	0	
MYSP2	1	0	0	
HIDA	1	0	0	
TYLA	1	1	0	
PEVI	1	0	0	

DO
Stargrass
SagittR
TYLA
A.Arum

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
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2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
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2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
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1 = Species suspe
2 = Genus suspected
3 = Unknown

Voucher:
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1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 7 of 11

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 7
Bed Size: 5.6
Substrate: 1
Marl? 0
High Organic? 1

Waterbody Name: Flint
Waterbody ID:
Total # of Species 4

CanopyAbundance at Site

S: 3 N: 1 F: 1 E: 1

SITE COORDINATES

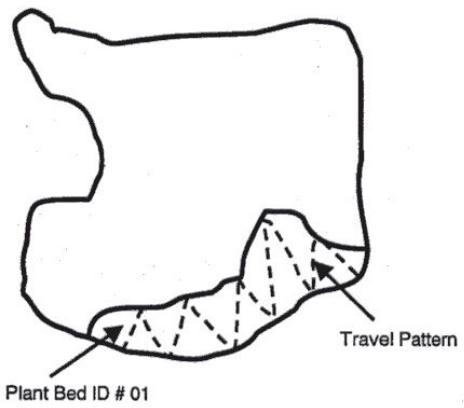
Center of the Bed
Latitude: N41.51478
Longitude: W87.04850

Max. Lakeward Extent of Bed
Latitude: N41.51487
Longitude: W87.04777

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
MYSP2	3	0	0	
CEDE4	3	0	0	
MYSI	2	0	0	
VAAM3	1	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

QE Code:
0 = as defined
1 = Species suspe
2 = Genus suspected
3 = Unknown

Voucher:
0 = Not Taken
1 = Taken, not varified
2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 8 of 11

State of Indiana Department of Natural Resources

ORGANIZATION: Aquatic Control

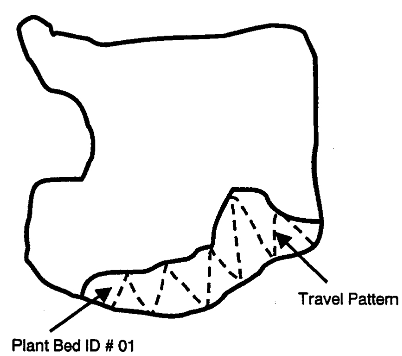
DATE: 8-9-06

SITE INFORMATION		SITE COORDINATES
Plant Bed ID: 8	Waterbody Name: Flint	Center of the Bed
Bed Size: 4.8		Latitude: N41.51438
Substrate: 1	Waterbody ID:	Longitude: W87.05049
Marl? 0	Total # of Species 13	Max. Lakeward Extent of Bed
High Organic? 1	CanopyAbundance at Site	Latitude: N41.51431
	S: 1 N: 2 F: 4 E: 1	Longitude: W87.04877

SPECIES INFORMATION

	Species Code	Abundance	QE	Vchr.	Ref. ID
	NULU	4	0	0	
A Ar	PEVI	2	0	0	
	POZO	1	0	0	
Willow	SALI	1	2	0	
Bush	CEOC	1	0	0	
Leafy	POFO	1	0	0	
	NYTU	1	0	0	
	UTCO	1	0	0	
Star Dw	LETR	1	0	0	
Dw	LEMI	1	0	0	
Giant	SPPO	1	0	0	
Swamp Rose	HIPA	1	0	0	
	ZODU	1	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
1 = Silt/Clay
2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
1 = < 2%
2 = 2-20%
3 = 21-60%
4 = > 60%

Abundance:
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Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

State of Indiana Department of Natural Resources

Page 9 of 11

ORGANIZATION: Aquatic Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 9

Bed Size: 2.7

Substrate: 3

Marl? 0

High Organic? 1

Waterbody Name: Flint

Waterbody ID:

Total # of Species 8

Canopy Abundance at Site

S: 2 N: 1 F: 1 E: 1

SITE COORDINATES

Center of the Bed

Latitude: N 41.51277

Longitude: W 87.04669

Max. Lakeward Extent of Bed

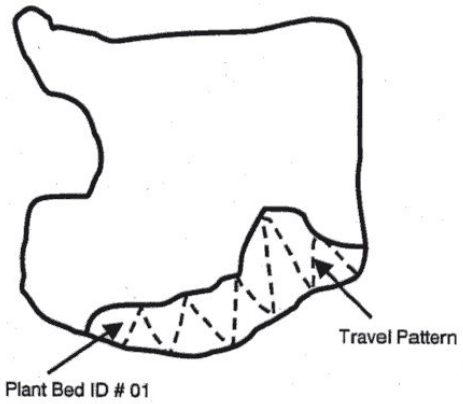
Latitude: N 41.51325

Longitude: W 87.04679

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
POGR	3	0	0	
NYTU	1	0	0	
PORI	1	0	0	
MYSP2	1	0	0	
CEDE4	1	0	0	
MYST	1	0	0	
VAAM3	3	0	0	
IRVE	1	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

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2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
N = Nonrooted floating
F = Floating, rooted
E = Emergent
S = Submersed

Canopy:
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Abundance:
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2 = Taken, varifie

Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 16 of 11

State of Indiana Department of Natural Resources

ORGANIZATION: A.Control

DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 10
Bed Size: 0.7
Substrate: 1
Marl? 0
High Organic? 1

Waterbody Name: Flint
Waterbody ID:
Total # of Species 5

CanopyAbundance at Site
S: 3 N: 1 F: 1 E: 1

SITE COORDINATES

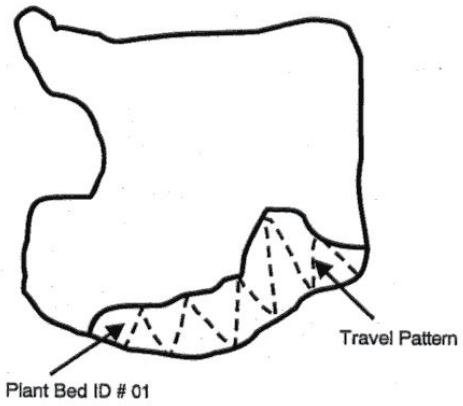
Center of the Bed
Latitude: N41.51181
Longitude: W87.04506

Max. Lakeward Extent of Bed
Latitude: N41.51206
Longitude: W87.04512

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
MYSP2	3	0	0	
MYSI	1	0	0	
VAAM3	2	0	0	
CEDE4	2	0	0	
POGR	2	0	0	

Individual Plant Bed Survey



Comments:

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Substrate:
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2 = Silt w/Sand
3 = Sand w/Silt
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5 = Gravel/Rock
6 = Sand

Marl
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0 = absent

High Organic
1 = Present
0 = absent

Overall Surface Cover
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F = Floating, rooted
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Abundance:
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Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Plant Bed Data Sheet

Page 11 of ___

State of Indiana Department of Natural Resources

ORGANIZATION: A.Control DATE: 8-9-06

SITE INFORMATION

Plant Bed ID: 11
Waterbody Name: Flint
Bed Size: 0.1
Substrate: 1
Waterbody ID:
Marl? 0
Total # of Species
High Organic? 1
CanopyAbundance at Site
S: 1 N: 1 F: 11 E: 1

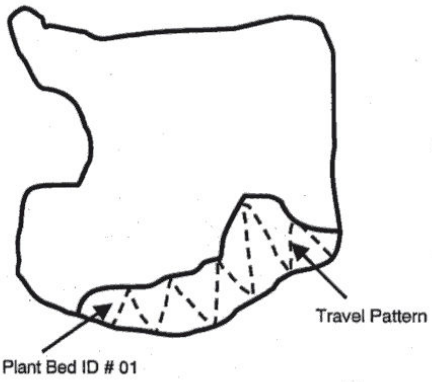
SITE COORDINATES

Center of the Bed
Latitude: N41.50979
Longitude: W87.04237
Max. Lakeward Extent of Bed
Latitude: N41.50988
Longitude: W87.04250

SPECIES INFORMATION

Species Code	Abundance	QE	Vchr.	Ref. ID
NULU	4	0	0	
PEVI	2	0	0	
WOCO	1	0	0	
LETH	1	0	0	
LETR	1	0	0	
POGR	1	0	0	
NYTU	2	0	0	

Individual Plant Bed Survey



Comments:

REMINDER INFORMATION

Substrate:
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2 = Silt w/Sand
3 = Sand w/Silt
4 = Hard Clay
5 = Gravel/Rock
6 = Sand

Marl
1 = Present
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High Organic
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Overall Surface Cover
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Reference ID:
Unique number or letter to denote specific location of a species; referenced on attached map

Aquatic Vegetation Random Sampling

Waterbody Cover Sheet

Organization Name: Aquatic Control

Waterbody Name: Flint Lake ID:

County: Porter Date: 8-9-06

Habitat Stratum: L Ave. Lake Depth (ft): Lake Level: Normal

GPS Metadata

Crew Leader: N. Long Datum: Nad27 Zone: 16 Accuracy: 3M

Recorder: R. Grey Method: BD

Secchi Depth (ft): 8.5 Total # of Sites Surveyed: 40 Total # of Species: 14

Littoral Zone Size (acres):
- ☐ Measured
- ☐ Estimated

Littoral Zone Max. Depth (ft): 17.0
- ☑ Measured
- ☐ Estimate (historical Secchi)
- ☐ Estimated (current Secchi)

Notable Conditions:

10, 10, 10, 10

APPENDIX A

Submersed Aquatic Plant Survey Form

Page 1 of 24

WATER BODY NAME Flint					SECCHI 8.5											
COUNTY Porter					MAX PLANT DEPTH 17ft											
DATE 8-9-06					WEATHER Cloudy 80											
CREW LEADER N. Long					COMMENTS											
RECORDER Ron																
					Rake score (1-5), observed only (9), algae present (p)											
					Use acronyms for species, V1, V2...for voucher codes											Note
					Species Code											
Site	Northing	Easting	Depth	All	CEDE4	MYSP2	CH?RA	MYSI	POGR	PORI	VAAM3	CHSP	POFO3	NAFL	RO	
1			7	5	1	1		1	1		5	1	1	1		
2			5	3	3	1			1		3					
3			16	3	3	1										
4			11	5	1	5		1								
5			4	3			1		1		3					
6			16	3	3											
7			10	5	1	5		5			1					
8			9	5	5	1				1	1					
9			11	5	5	1			1				1			
10			4	5	1		1		1	3	1	1				
11			12	5	5	5		1								
12			10	5	5	1		1			1		3			
13			20	NP												
14			5	3			3				1					
15			18	NP												
16			11	5	5						1			1		
17			8	5	5	1				3	3	1				
18			17	3	3											
19			8	5	5	5		1			3					
20			14	5	5											
21			9	5	5	3		3								
22			9	5	5	5		3								
23			11	5	3			3			3			1		
24			4	5	3		1		3		3					
25			13	3	3											
26			3	5	3		1		1		3					
27			16	1									1			
28			4	3	1	1		1	1		1					
29			13	5	5	1		1								
30			4	3			1		1		3					
31			16	1	1						1	1	1			
32			6	5	5	1						3				
Other plant species observed at lake																
	NUCH	NYTU	Sucb Rose m.		Iris.											

Algae

NL

SAGLAT

APPENDIX A

Submersed Aquatic Plant Survey Form

Page 2 of 4

WATER BODY NAME						SECCHI								
COUNTY						MAX PLANT DEPTH								
DATE						WEATHER								
CREW LEADER						COMMENTS								
RECORDER														
					Rake score (1-5), observed only (9), algae present (p)									
					Use acronyms for species, V1, V2...for voucher codes									Note
										Species Code				
Site	Northing	Easting	Depth	All	POPEG	POZO	CEEC (Spirodela)			MYHE				
1														
2					1									
3														
4						1	1							
5														
6						1								
7														
8														
9														
10														
11						1								
12														
13														
14														
15														
16														
17														
18														
19						1								
20														
21														
22														
23														
24														
25														
26														
27														
28														
29										1				
30														
31														
32														
Other plant species observed at lake														

APPENDIX A

Submersed Aquatic Plant Survey Form

Page 2 of 2

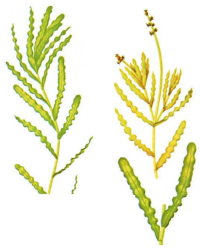
WATER BODY NAME					SECCHI								
COUNTY					MAX PLANT DEPTH								
DATE					WEATHER								
CREW LEADER					COMMENTS								
RECORDER													
					Rake score (1-5), observed only (9), algae present (p)								
					Use acronyms for species, V1, V2...for voucher codes								Note
					Species Code								
Site	Northing	Easting	Depth	All	ZODU	CCOE	POZO	MYSI	MYSP	EUNI	MIRE		
33			7	5	3	3	3	1					
34			19	NP									
35			11	5		5	1		1				
36			3	1		1		1	1				
37			11	5		5	1	1	3	1			
38			3	3	1	1					1		
39			16	NP									
40			16	5		5		1					
Other plant species observed at lake													

16.2 Species List. Macrophyte List for the Flint Lake.

Common Name	Scientific Name	2006 Tier I	2006 Tier II
Arrow arum	*Peltandra virginica*	X	
Blue-flag Iris	*Iris versicolor*	X	
Button bush	*Cephalanthus occidentalis*	X	
Chara	*Chara spp.*		X
Common cattail	*Typhia latifolia*	X	
Common coontail	*Ceratophyllum demersum*	X	X
Curlyleaf pondweed	*Potamogeton crispus*	X	
Duckweed	*Lemna minor*	X	
Eel grass	*Valisneria americana*	X	X
Eurasian watermilfoil	*Myriophyllum spicatum*	X	X
Flatstem pondweed	*Potamogeton zosteriformis*	X	X
Giant duckweed	*Spirodela polyrhiza*	X	
Illinois pondweed	*Potamogeton illinoensis*	X	
Leafy pondweed	*Potamogeton foliosus*	X	X
Nitella	*Nitella spp.*		X
Northern watermilfoil	*Myriophyllum sibiricum*	X	X
Prickly coontail	*Ceratophyllum echinatum*		X
Richardson's pondweed	*Potamogeton richardsonii*	X	X
Sago pondweed	*Potamogeton pectinatus*	X	X
Slender naiad	*Najas flexilis*	X	X
Spatterdock	*Nuphar advena*	X	
Star duckweed	*Lemna trisulca*	X	
Swamp Rose Mallow	*Hibiscus palustris*	X	
Watermeal	*Wolffia columbiana*	X	
Water stargrass	*Zosterella dubia*	X	X
White water lily	*Nymphaea odorata*	X	
Variable pondweed	*Potamogeton gramineus*	X	X
Variable watermilfoil	*Myriophyllum heterophyllum*		X

Chara (*chara spp.)* is an anchored green algae with whorled, branchlike filaments at the nodes of a central axis. Often times mistaken for vascular plants. Typically inhabits shallow water. Provide food and cover for wildlife. Rarely reaches the surface of the water and rarely causes problem.

Common coontail (*Ceratophylum demersum*) is a commonly occurring aquatic plant in the Midwest in neutral to alkaline waters[1]. It is a submersed dicot with coarsely toothed leaves whorled about the stem[2]. This plant is given its name due to its resemblance to the tail of a raccoon. Coontail has been found to be an important food source for wildfowl as well as a good shelter for small animals[2]. This plant is also a good shelter for young fish, and support of insects[2], but has been known to crowd out other species of aquatic plants[3].



Curlyleaf pondweed (*Potamogeton crispus*) is a submersed monocot with slightly clasping, rounded tip leaves. The flowers occur on dense cylindrical spikes and produces distinctive beaked fruit[1]. Curly leaf is eaten by ducks, but may become a weed[2]. This plant provides good food, shelter, and shade for fish and is important for early spawning fish like carp and goldfish[2].

Eurasian watermilfoil (*Myriophyllum spicatum*) is an exotic aquatic plant that has been known to crowd out native species of plants. This species spreads quickly because it can grow from very small plant fragments and survive in low light and nutrient conditions[3]. This dicot has stems that typically grow to the water surface and branch out forming a canopy that shades other species of aquatic plants. Eurasian water-milfoil has characteristic red to pink flowering spikes that protrude from the water surface one to two inches high[1]. The segmented leaves grow in whorls of three to four around the stem[1]. It can grow from very small plant fragments and survive in low light and nutrient conditions. This dicot has stems that typically grow to the water surface and branch out forming a canopy that shades other species of aquatic plants.

[1] Chadde, S. 1998. Great lakes wetland flora. Pocketflora Press, Calumet, Michigan.

[2] Fassett, N. 1957. A manual of aquatic plants, 2nd edition. The University of Wisconsin Press, Madison, Wisconsin.

[3]Applied Biocehmists, 1998. Water weeds and algae, 5th edition. Applied Biochemists, J. C. Schmidt and J. R. Kannenberg, editors. Milwaukee, Wisconsin. (all plant illustrations supplied by Applied Biochemist)

16.3 IDNR VEGETATION PERMIT

APPLICATION FOR AQUATIC VEGETATION CONTROL PERMIT
State Form 26727 (R / 11-03)
Approved State Board of Accounts 1987
[ ] Whole Lake [X] Multiple Treatment Areas
Check type of permit

INSTRUCTIONS: Please print or type information

FOR OFFICE USE ONLY
License No.
Date Issued
Lake County

Return to: Page 1 of 4
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Commercial License Clerk
402 West Washington Street, Room W273
Indianapolis, IN 46204

FEE: $5.00

Applicant's Name	Lake Assoc. Name	
Valparaiso Area Lakes Conservancy District	Valparaiso Area Lakes Conservancy District	
Rural Route or Street: 1805 Burlington Beach Road		Phone Number: 219-464-3770
City and State: Valparaiso IN		ZIP Code: 48383
Certified Applicator (if applicable)	Company or Inc. Name	Certification Number
Rural Route or Street		Phone Number
City and State		ZIP Code

Lake (One application per lake)	Nearest Town	County
Flint Lake	Valparaiso	Porter
Does water flow into a water supply		[ ] Yes [X] No

Please complete one section for *EACH* treatment area. Attach lake map showing treatment area and denote location of any water supply intake.

Treatment Area #	1	LAT/LONG or UTM's	Center @ N41.51326 W87.03954		
Total acres to be controlled	19.5	Proposed shoreline treatment length (ft)	4000	Perpendicular distance from shoreline (ft)	300
Maximum Depth of Treatment (ft)	12	Expected date(s) of treatment(s)	mid May to early June		

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Renovate herbicide to selectively control Eurasian watermilfoil

Plant survey method: [X] Rake [X] Visual [ ] Other (specify) Summarized from August Sampling

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian watermilfoil	x	50
Common coontail		10
Eel Grass		10
Richardson's pondweed		10
Northern watermilfoil		10
Variable pondweed		5
Flatstem pondweed		3
White water lily		2

AQUATIC CONTROL

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Treatment Area # 2	LAT/LONG or UTM's Center of bed at N41.51472 W87.04866	
Total acres to be controlled 5.5	Proposed shoreline treatment length (ft) 1500	Perpendicular distance from shoreline (ft) 300
Maximum Depth of Treatment (ft) 12	Expected date(s) of treatment(s) mid May to early June	

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Renovate herbicide to selectively control Eurasian watermilfoil

Plant survey method: [X] Rake [X] Visual [ ] Other (specify) Summarized from August Sampling

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian watermilfoil	x	40
Common coontail		40
Northern watermilfoil		15
Eel grass		5

Treatment Area # 3	LAT/LONG or UTM's Center of bed at N41.51182 W87.04516	
Total acres to be controlled 0.8	Proposed shoreline treatment length (ft) 300	Perpendicular distance from shoreline (ft) 200
Maximum Depth of Treatment (ft) 12	Expected date(s) of treatment(s) mid May to early June	

Treatment method: [X] Chemical [ ] Physical [ ] Biological Control [ ] Mechanical

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Renovate herbicide to selectively control Eurasian watermilfoil

Plant survey method: [X] Rake [X] Visual [ ] Other (specify)

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian watermilfoil	X	50
Common coontail		15
Eel grass		15
Variable pondweed		15
Northern watermilfoil		5

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Treatment Area # 4	LAT/LONG or UTM's Areas to be determined following spring sampling		
Total acres to be controlled ?	Proposed shoreline treatment length (ft) ?	Perpendicular distance from shoreline (ft) ?	
Maximum Depth of Treatment (ft) ?	Expected date(s) of treatment(s) mid May to early June		
Treatment method: [X] Chemical [ ] Physical	[ ] Biological Control	[ ] Mechanical	

Based on treatment method, describe chemical used, method of physical or mechanical control and disposal area, or the species and stocking rate for biological control. Renovate herbicide to selectively control Eurasian watermilfoil where it occurs following spring sampling (See AVMP)

Plant survey method: [ ] Rake [ ] Visual [ ] Other (specify) Summarized from August Sampling

Aquatic Plant Name	Check if Target Species	Relative Abundance % of Community
Eurasian watermilfoil	X	15
Common coontail		25
Eel grass		15
Northern watermilfoil		10
Variable pondweed		10
Chara		5
Richardson's pondweed		5
Variable watermilfoil		1
Common naiad		1
Nitella		1
Flatstem pondweed		5
Water stargrass		5
Sago pondweed		1
Spiny coontail		1

INSTRUCTIONS: Whoever treats the lake fills in "Applicant's Signature" unless they are a professional. If they are a professional company who specializes in lake treatment, they should sign on the "Certified Applicant" line.

Applicant Signature	Date
Certified Applicant's Signature	Date

FOR OFFICE ONLY

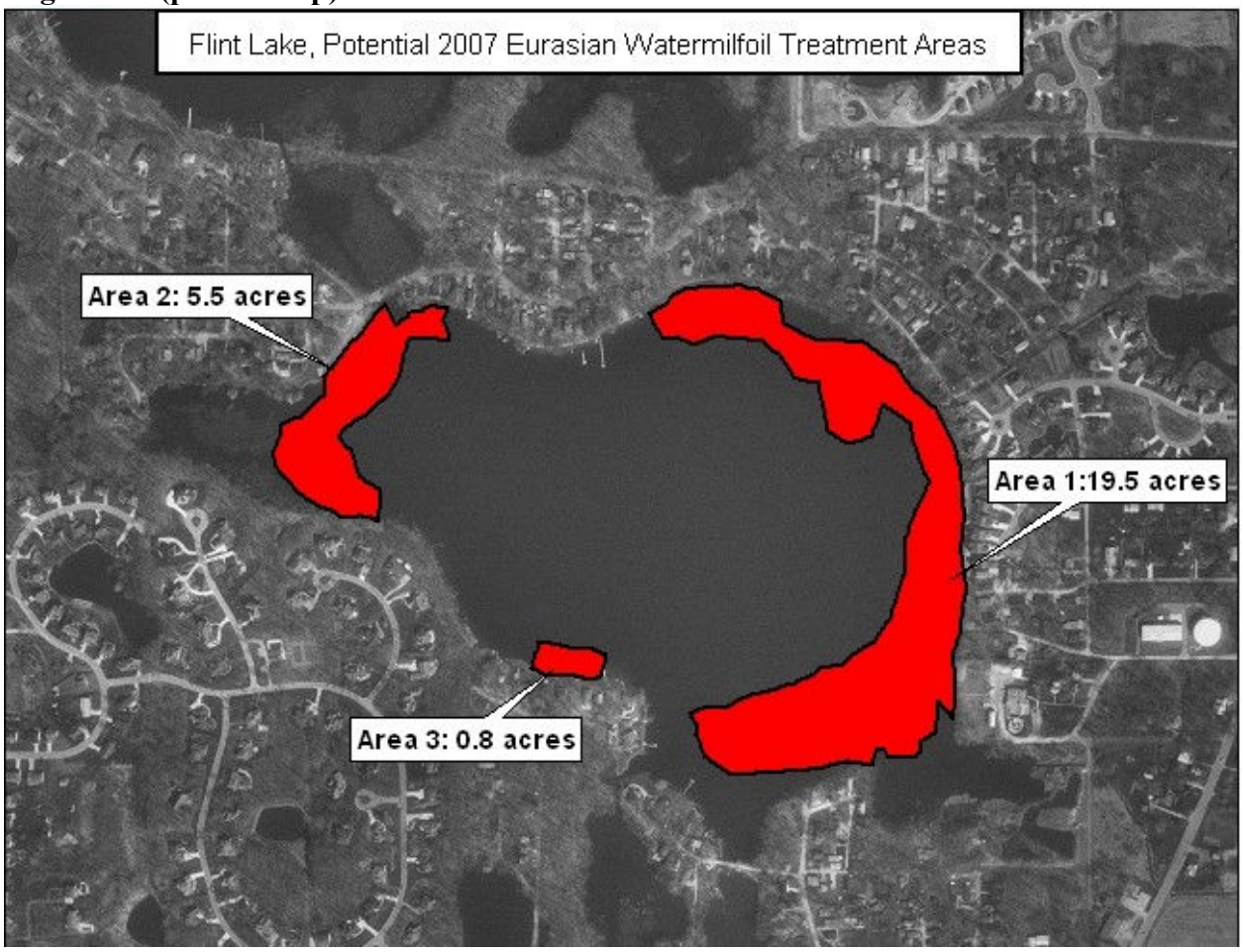
[ ] Approved [ ] Disapproved	Fisheries Staff Specialist
[ ] Approved [ ] Disapproved	Environmental Staff Specialist

Mail check or money order in the amount of $5.00 to:

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
COMMERCIAL LICENSE CLERK
402 WEST WASHINGTON STREET ROOM W273
INDIANAPOLIS, IN 46204

AQUATIC CONTROL

Page 4 of 4 (permit map)



16.4 PUBLIC INPUT QUESTIONARE

Lake Use Survey Lake name_____

Are you a lake property owner? Yes_____ No_____

Are you currently a member of your lake association? Yes ___ No___

How many years have you been at the lake? 2 or less
2 – 5 years
5-10 years
Over 10 years

How do you use the lake (mark all that apply)

___Swimming ___Irrigation
___Boating ___Drinking water
___Fishing ___Other _____

Do you have aquatic plants at your shoreline in nuisance quantities? Yes ___ No ___

Do you currently participate in a weed control project on the lake? Yes ___ No ___

Does aquatic vegetation interfere with your use or enjoyment of the lake? Yes ___ No___
Does the level of vegetation in the lake affect your property values? Yes ___ No ___

Are you in favor of continuing efforts to control vegetation on the lake? Yes ___ No ___

Are you aware that the LARE funds will only apply to work controlling invasive exotic species, and more work may need to be privately funded? Yes ___ No ___

Mark any of these you think are problems on your lake:

___ Too many boats access the lake
___ Use of jet skis on the lake
___ Too much fishing
___ Fish population problem
___ Dredging needed
___ Overuse by nonresidents
___ Too many aquatic plants
___ Not enough aquatic plants
___ Poor water quality
___ Pier/funneling problem

Please add any comments:

_____

_____

16.5 RESOURCES FOR AQUATIC VEGETATION MANAGEMENT

Books
Aquatic Plant Management in Lakes and Reservoirs
Aquatic Plants of Illinois
A Manual of Aquatic Plants
Managing Lakes and Reservoirs
Interactions Between Fish and Aquatic Macrophytes in Inland Waters
Lake and Reservoir Restoration

Societies/Wesites
Aquatic Plant Management Society-apms.org
Midwest Aquatic Plant Management Society-mapms.org
North American Lake Management Society-nalms.org
Inidiana Lake Management Society-indianalakes.org